i3 INTERNATIONAL™

cortex

User's Manual

SW-26210

24-Port PoE + 2-Port Web Smart Switch

Rev. 141022

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This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at whose own expense.

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Energy Saving Note of the Device

This power required device does not support Standby mode operation.

For energy saving, remove the power cable to disconnect the device from the power circuit.

Without removing power cable, the device will still consume power from the power source. In the view of Saving the Energy and reduce the unnecessary power consuming, it is strongly suggested to remove the power connection for the device if this device is not intended to be active.

WEEE Warning

To avoid the potential effects on the environment and human health as a result of the presence of hazardous substances in electrical and electronic equipment, end users of electrical and electronic equipment should understand the meaning of the crossed-out wheeled bin symbol. Do not dispose of WEEE as unsorted municipal waste and have to collect such WEEE separately.

Revision

i3 International 24-Port 10/100BaseT with 2 RJ-45/SFP 10/100/1000BaseT Web Smart Switch User’s Manual

FOR MODELS: SW-26210

REVISION: 1.4.2

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1. INTRODUCTION

1.1. Product Overview

This switch provides 24 10/100Mbps RJ-45 ports, includes auto MDI/MDIX crossover detection function and can support 2 Combo Gigabit RJ-45/SFP to uplink. 24 of those ports provide PoE functionality, providing the ultimate choice in network flexibility. With this added PoE feature, this switch is an ideal solution for building wireless IP surveillance, and VoIP networks.

It also provides port-based and 802.1Q tag VLAN function to provide better traffic management, reduces latency, improve security and save bandwidth without adding hardware to the network.

The purpose of this manual is to provide the user with the knowledge necessary to safely and properly deploy network technology using this switch.

1.2 Product Features

Web Management

- Port Management
  - Port Configuration
  - Port Mirroring
  - Bandwidth Control
  - Broadcast Strom Control
  - PoE On/Off Setting
- VLAN Setting
  - Port-based/ Tag-based
  - VLAN ID: 1~4094
- Trunking
  - Link Aggregation Setting
  - 2 groups (1~4 port for each group)
- QoS Setting
  - Priority Mode
  - Class of Service Configuration
  - TCP/UDP Port-based
- Security Setting
  - MAC address filtering
  - TCP/UDP Port filtering
- STP/RSTP
- Spanning Tree Protocol
- Backup Recovery Configuration

Specifications

- Standards
  - IEEE 802.3 10BaseT
  - IEEE 802.3u 100BaseTX
  - IEEE 802.ab 1000BaseT
  - IEEE 802.3z 1000BaseSX/LX
  - IEEE 802.3x Full-duplex and Flow Control
  - IEEE 802.at PoE
  - IEEE 802.3ad Link Aggregation
  - IEEE 802.1d Spanning tree protocol
  - IEEE 802.1w Rapid Spanning tree protocol
  - IEEE 802.1x Port-based Network Access Control
  - IEEE 802.1Q VLAN
  - IEEE 802.1p Class of Service
- Number of Ports
  - 24-port 10/100BaseTX with PoE
  - 2-port Combo Gigabit uplink (RJ-45/SFP)

Mechanical

- LED Indicator
  - Per Port: Link/ Act
  - PoE Port: Act/Status
  - Per Unit: Power
- Power Consumption: 390Watts (Max)
- Power Input: 100~240V/AC, 50~60HZ
- Power Output: 48V/DC per Port Output – 30W Max per Port
- Product Dimensions/ Weight
  - 45 × 440 × 330 mm (H × W ×D) / 4.6kg

Performance

- MAC Address: 4K
- Buffer Memory: 2.75Mb
- Transmission Method: Store-and-Forward

2. INSTALLATION

This section describes the hardware features and installation of the SW-26210 Web Smart Switch. For easier management and control, familiarize yourself with its display indicators and ports. Read this chapter completely before connecting any network device to it.

2.1. Hardware Installation

2.1.1 Package Contents

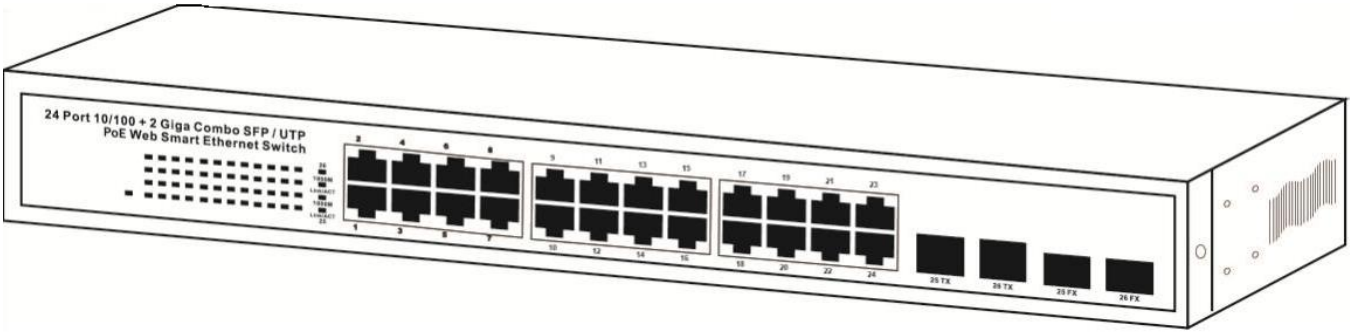


Figure 1 - SW-26210 switch

Prior to installing this switch, verify that your package that contains the following items:

- SW-26210 Switch
- Power Cord
- User Manual CD
- Rack-mounting kit

If any of these are missing or damaged, please contact your dealer immediately, if possible, retain the carton including the original packing material, and use them again to repack the product in case there is a need to return it for repair.

2.1.2 Hardware Description

Physical Dimensions/ Weight

45 × 440 × 330 mm (H × W ×D) / 4.6kg

Front Panel

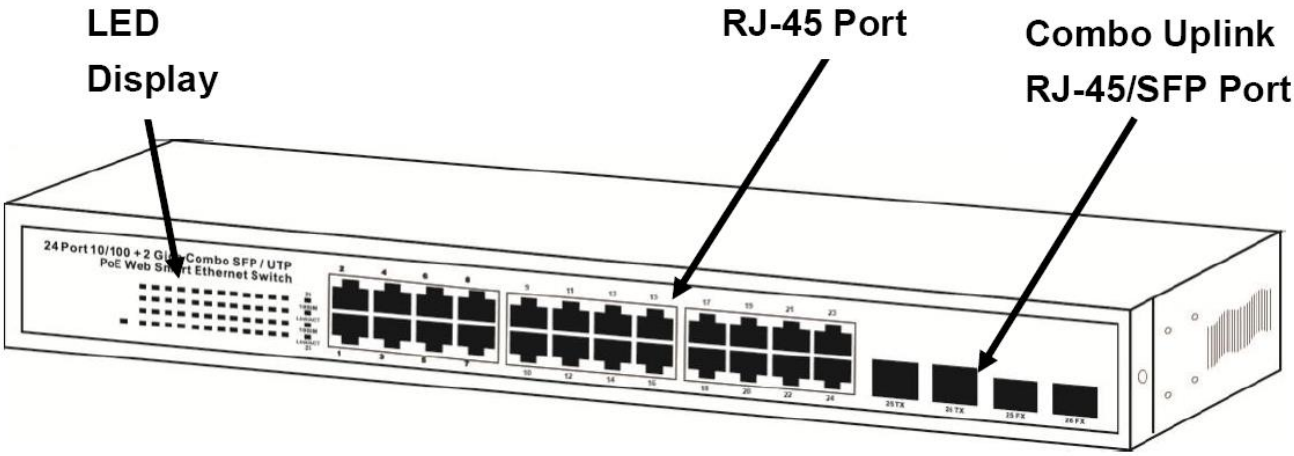


Figure 2 - Front panel overview

The front panel of the web smart switch consists of 24 10/100Base-TX RJ-45 ports and 2 combo gigabit uplink RJ-45/SFP ports. The LED Indicators are also located on the front panel.

LED Indicators

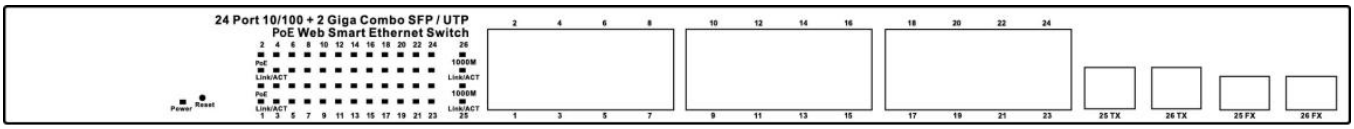


Figure 3 - Front panel overview

The LED Indicators present real-time information of systematic operation status. The following table provides description of LED status and their meaning.

LED	Status	Description	Label
Power	On	Power switch on/off	Power
1000M	On	Link transmission at 1000 Mbps	2 (25-26)
	Off	Link transmission at 10/100 Mbps	
Link/ACT	On	Link	26 (1~26)
	Flashing	Data activating	
PoE	On	Port is linked to powered device	24 (1~24)
	Off	No Powered device connected	

Table 1 - LED status descriptions

Rear Panel

The 3-pronged power plug is placed at the rear panel of the switch right side shown as below.

Figure 4 - Back panel overview

2.1.2. Hardware Installation

Set the switch on a large flat space with a power socket close by. The flat space should be clean, smooth, level and sturdy. Make sure there is enough clearance around the switch to allow attachment of cables, power cord and allow air circulation. Use twisted pair cable to connect this switch to your PC.

3. SOFTWARE CONFIGURATION

This section describes the software configuration of the SW-26210 switch using the Web Interface.

3.1. Logging In

Open a web browser, and enter the address ***192.168.0.10*** *(for switches with the F/W version V141015 or newer) or* ***192.0.0.20*** *(for switches with the F/W version V131216 or older).* A login screen will appear.

Figure 5 - Login screen

The factory default password and login for switches with the F/W version v141015 or newer: Username: **i3admin**; Password: **i3admin**

The factory default password and login for switches with the F/W version V131216 or older: Username: **admin**; Password: **admin**

On authentication, "Password successfully entered" will appear and you will be taken to the main page.

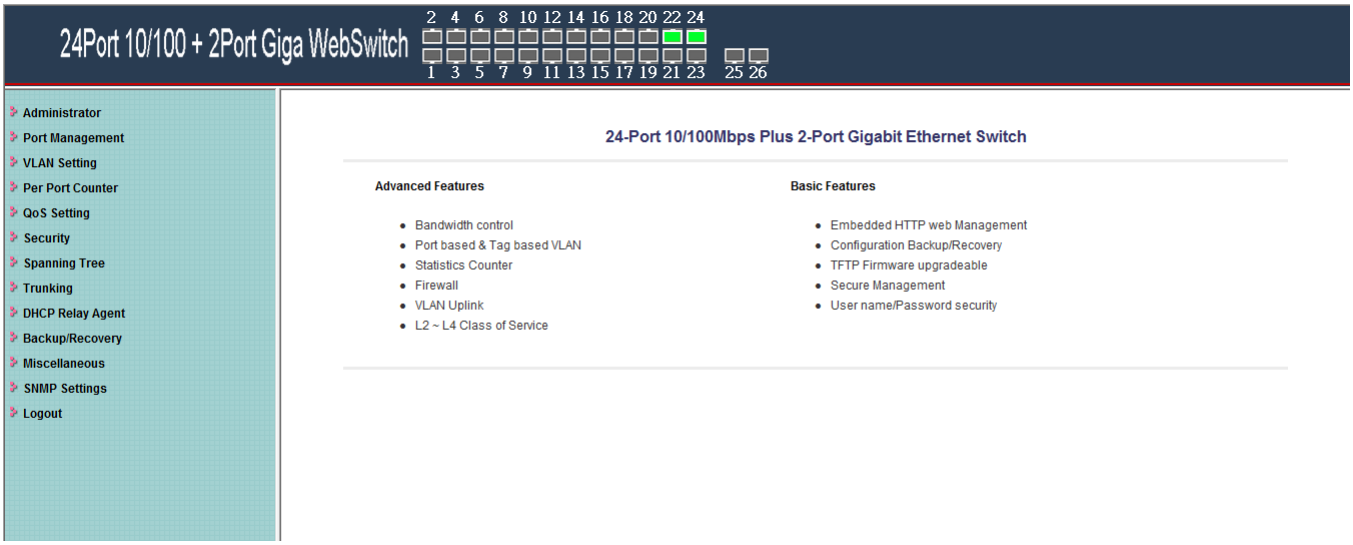


Figure 6 - Web interface main page

If not, this message will appear.

Figure 7 - Login error

3.2. Administration

3.2.1. Administrator

Clicking on ***Administrator*** in the navigation pane will bring up administrative options on the main pane. If this is your first login, change the username and password in the Authentication Configuration section.

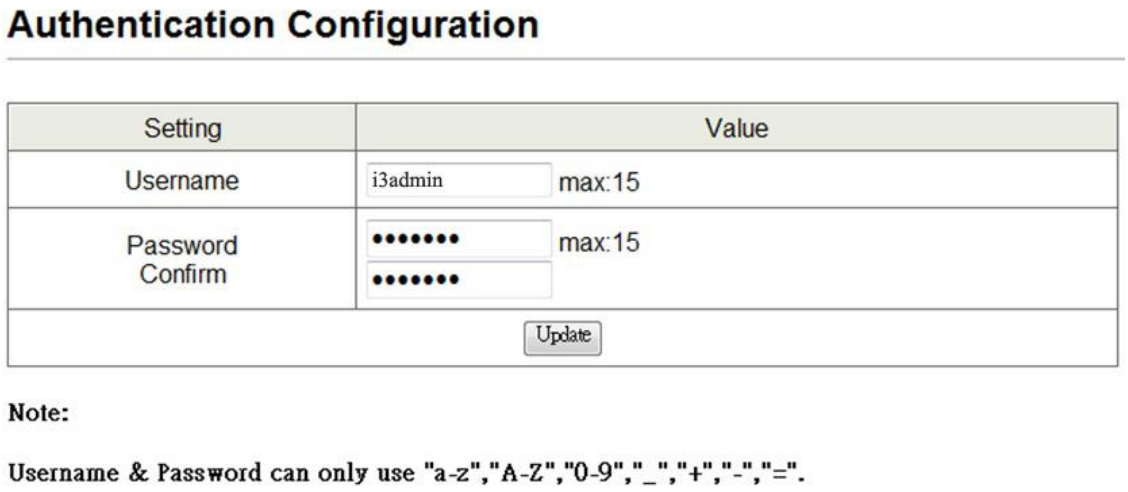


Figure 8 - Set the username and password

3.2.2. System IP Configuration

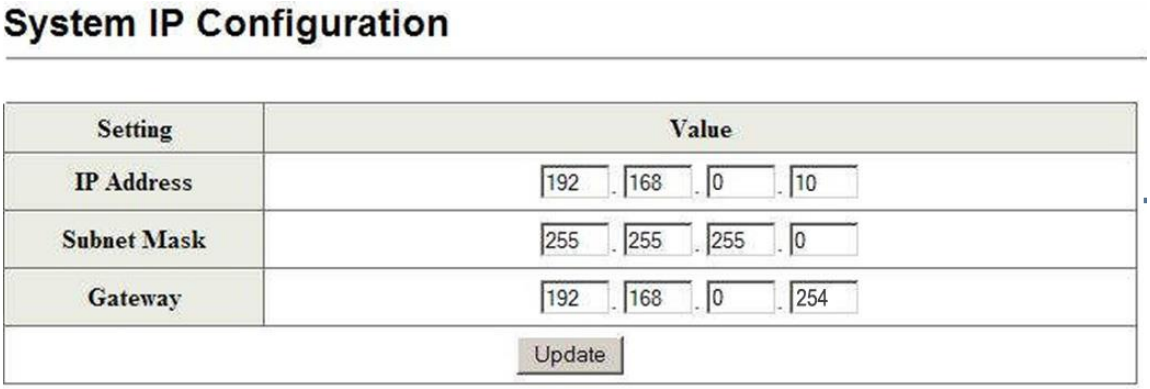


Figure 9 - Configure the switch IP

This page sets information on the system configuration including the current IP address, subnet mask and gateway. Parameters are as follows:

- IP address: Manually assign the IP address of the switch. The default IP Address is: ***192.168.0.10*** *(for switches with the F/W version V141015 or newer) or* ***192.0.0.20*** *(for switches with the F/W version V131216 or older).*
- Subnet Mask: Assign the subnet mask to the IP address.
- Gateway: Assign the network gateway. Default gateway is: **192.168.0.254** (for switches with the F/W version V141015 or newer) or **192.0.0.254** (for switches with the F/W version V131216 or older).

Click **Update** to save your changes. Note: Changing the IP address will require a reboot.

3.2.3. System Status

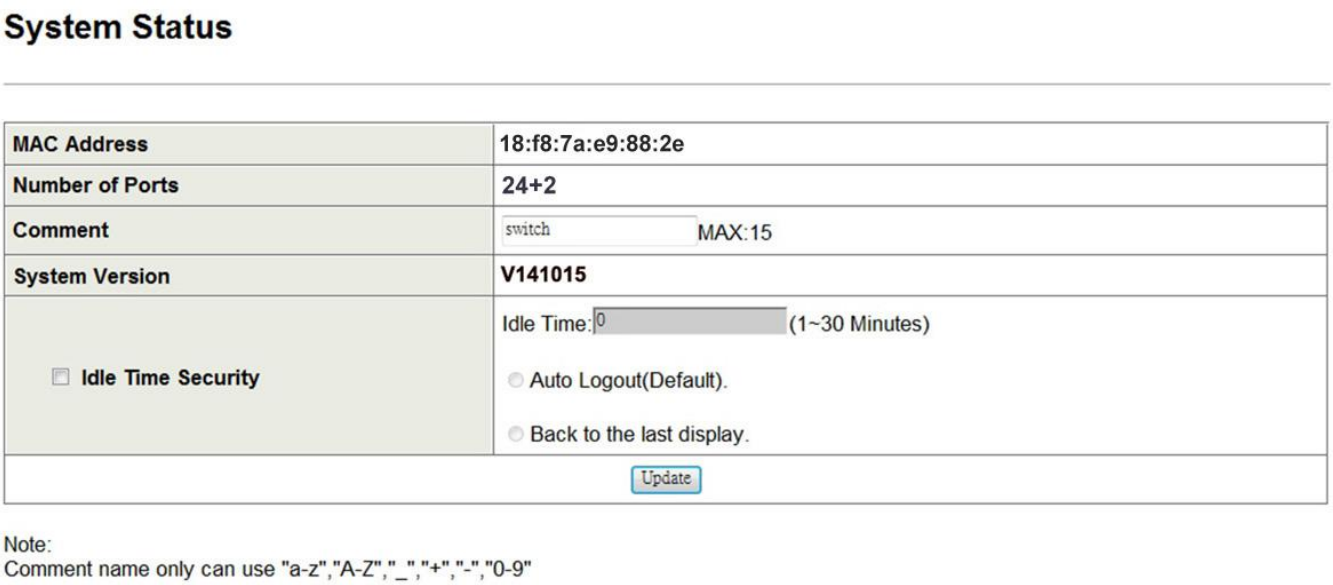


Figure 10 - An overview of the switch

This page displays basic information about the switch.

- MAC Address: Displays the unique hardware address assigned by manufacturer (default).
- Number of Ports: Displays number of ports in the switch.
- Comment: This field may be used for notes. A maximum of fifteen characters is allowed.
- System Version: Displays the switch's firmware version.
- Idle Time Security: When the web interface has been idle for an amount of time, the software will auto logout or revert back to the last display. Set an **Idle time** in the corresponding field. Click **Auto Logout (Default)** to shut down the switch when the interface has been idle for the duration specified. Click **Back to the last display** to revert the web interface back to the last screen when the interface has been idle for the duration specified.

Click **Update** to save your changes

3.3. Factory Settings

3.3.1. Software Reset

Click the **Load** button to revert the switch to its original factory configurations with the exception of the user name, password and IP configuration.

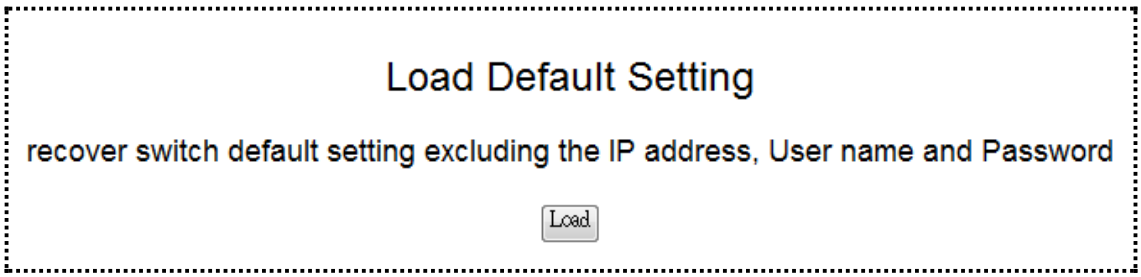


Figure 11 - Reset to factory defaults

Note

If a factory reset of the user name, password and IP configuration settings is desired, press the hard (physical) reset button on the switch.

3.3.2. Hardware Reset

Press the physical reset button on the switch to revert to its original factory configurations including settings which are not covered by the software reset.

(1) To activate, press the factory reset button for 5 seconds until the LED begins to blink.

(2) The blinking LED signals that the CPU is executing the reset procedure. Release the button.

After completing this procedure, all the factory settings will be restored including the IP address, the user name, the password as well as all other switch configurations.

3.4. Firmware Update

Before updating the switch firmware, it is recommended that flash memory on the switch be erased. The Boot Loader will be kept intact by a self-protection mechanism which ensures correct functioning even in the event of power loss or network failure during the update.

Firmware Update
Please input the password to continue the Firmware Update process.
Password
ReConfirm
Update
Notice:After clicking the "UPDATE" button, IF the firmware update webpage is not redirected correctly or is shown as "Webpage not found". Please connect to http://192.168.0.10

Figure 12 - Confirm the firmware update

Enter your password and confirm it in the appropriate fields. Click **Update**. This screen will appear.

Firmware Update by Web
Select the image file:
Browse...
UPDATE
If the update process somehow goes wrong(Ex: power failure), please connect to
http://192.168.0.10 to restart.(If possible, reset device first.)
Firmware Update by TFTP
(TFTP client)Use MS Windows' Command Prompt window to run tftp client program.
Syntax: c:\tftp -i 192.168.0.10 put FILE_DIRECTORY\FILENAME.bin

Figure 13 - Select an update file

Click **Browse...** to select the new firmware image and Click **Update** to save your changes.

3.5. Reboot

To perform a soft reboot, click **Confirm** to reboot the device. To perform a hard reboot, use the factory default button on the switch.

Figure 14 - Confirm to reboot

3.6. Logging out

At any time, click the Logout link on the navigation pane to log out of the web interface.

4. PORT MANAGEMENT

Port Management includes Port Configuration, Port Mirroring, Bandwidth Control, Broadcast Storm Control and PoE

4.1. Port Configuration

To access port configuration options, click on the link ***Port Configuration*** in the navigation pane of the web interface.

4.1.1 Auto-negotiation

Auto-negotiation automatically sets the best possible bandwidth when a connection is established with another network device (usually at Power On or Reset). This is done by detecting the modes and speeds both connected devices are capable of. Both 10Base-T and 100Base-TX devices can connect with the port in either Half- or Full-Duplex mode.

If attached device is:	100Base-TX port will set to:
10Mbps, no auto-negotiation	10Mbps.
10Mbps, with auto-negotiation	10/20Mbps (10Base-T/Full-Duplex)
100Mbps, no auto-negotiation	100Mbps
100Mbps, with auto-negotiation	100/200Mbps (100Base-TX/Full-Duplex)

Table 2 - Auto-negotiation summary

In Port Configuration, you can set and view the operation mode for each port. Check the checkbox next to the port number to view or change its current configuration. Configure the ports using the dropboxes at the top.

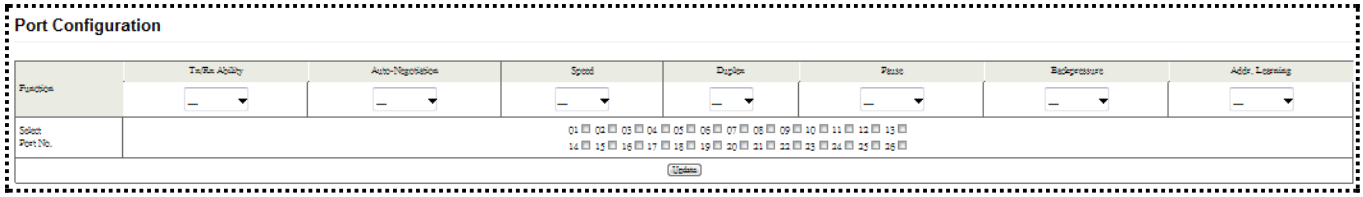


Figure 15 – Configure auto-negotiation settings

- Select Port No.: Check the check boxes beside the port numbers being set.

The parameters are:

- Auto-Negotiation: Select ***Enable*** or ***Disable***. If enabled the Speed, Duplex mode, Pause, Backpressure, TX Capability and Address Learning are negotiated automatically. If disabled, these parameters must be assigned manually.
- Speed: When Auto-Negotiation is disabled, the speed must be manually specified.
- Duplex: When Auto-Negotiation is disabled, the connection mode, either Half or Full must be specified.
- Pause: Flow Control for the connection at a speed of 10/100Mbps in Full-duplex mode.
- Backpressure: Flow Control for the connection at a speed of 10/100Mbps in Half-duplex mode.
- TX/RX Capability: When Auto-Negotiation is disabled, users must manually ***Enable*** or ***Disable*** TX/RX.
- Addr. Learning: When Auto-Negotiation is disabled, users must manually ***Enable*** or ***Disable*** Address Learning.

- The display shows the following information:
- Current Status: Displays current port status.
- Setting Status: Displays current status.

Click **Update** to save your changes. A table at the bottom of the main pane displays a summary of each port's configuration.

Port	Current Status				Setting Status						
	Link	Speed	Duplex	FlowCtrl	Tx/Rx Ability	Auto-Nego	Speed	Duplex	Flow	Backpressure	Addr. Learning
1	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
2	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
3	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
4	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
5	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
6	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
7	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
8	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
9	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
10	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
11	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
12	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
13	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
14	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
15	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
16	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
17	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
18	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
19	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
20	●	100M	FULL	ON	ON	AUTO	100M	FULL	ON	ON	ON
21	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
22	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
23	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
24	---	---	---	---	ON	AUTO	100M	FULL	ON	ON	OFF
25	---	---	---	---	ON	AUTO	1G	FULL	ON	ON	OFF
26	---	---	---	---	ON	AUTO	1G	FULL	ON	ON	OFF

Figure 16 - Port statuses

4.2. Port Mirroring

Configure port Mirroring on this page. This function monitors network traffic that forwards a copy of each incoming or outgoing packet from one port of a network switch to another port where the packet can be studied. It enables the manager to keep close track of switch performance and alter it if necessary.

Port Mirroring

Dest Port	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐	11 ☐	12 ☐	13 ☐
	14 ☐	15 ☐	16 ☐	17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐	25 ☐	26 ☐
Monitored Packets	Disable ▾												
Source Port	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐	11 ☐	12 ☐	13 ☐
	14 ☐	15 ☐	16 ☐	17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐	24 ☐	25 ☐	26 ☐
Update													
Multi to Multi Sniffer function													

Figure 17 – Configure port mirroring

The parameters for this setting are:

- Destination (mirroring) port: For monitoring RX only, TX only or both RX and TX traffic from the source port. Mirroring ports can be

connected to a LAN analyzer or Netxray.

- Monitored Packets: Expand the drop-down menu to select between RX, TX or both RX and TX.
- Source Port: Select ports to monitor. All monitored port traffic will be copied to the mirroring (destination) port. Select multiple source ports by ticking the check boxes beneath the port number label to be monitored.

Click **Update** to save your changes

4.3. Bandwidth Control

Configure the allowed bandwidth on this page. The TX rate and Rx rate is given in a number ranging from ***1*** to ***255***. This number should be multiplied by the selected bandwidth resolution to get the actual bandwidth.

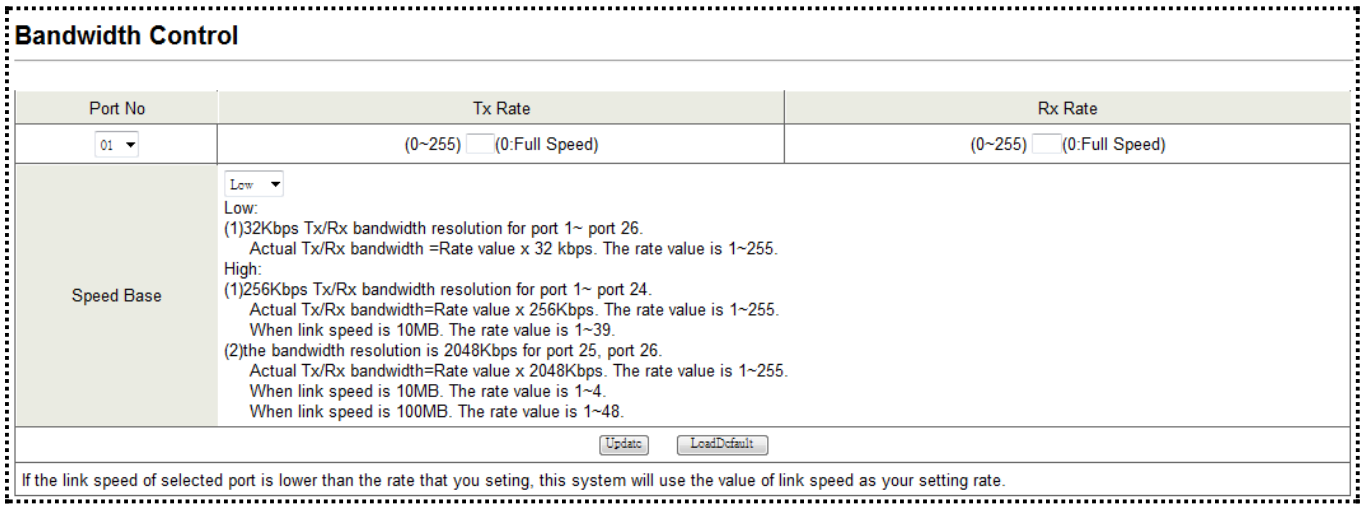

Bandwidth Control
Port No
Tx Rate
Rx Rate
01
(0~255) (0:Full Speed)
(0~255) (0:Full Speed)
Speed Base
Low
Low:
(1)32Kbps Tx/Rx bandwidth resolution for port 1~ port 26.
Actual Tx/Rx bandwidth =Rate value x 32 kbps. The rate value is 1~255.
High:
(1)256Kbps Tx/Rx bandwidth resolution for port 1~ port 24.
Actual Tx/Rx bandwidth=Rate value x 256Kbps. The rate value is 1~255.
When link speed is 10MB. The rate value is 1~39.
(2)the bandwidth resolution is 2048Kbps for port 25, port 26.
Actual Tx/Rx bandwidth=Rate value x 2048Kbps. The rate value is 1~255.
When link speed is 10MB. The rate value is 1~4.
When link speed is 100MB. The rate value is 1~48.
Update
LoadDefault
If the link speed of selected port is lower than the rate that you seting, this system will use the value of link speed as your setting rate.

Figure 18 - Set allowed bandwidth

A bandwidth usage summary is seen below.

Port No.	Tx Rate	Rx Rate	Link Speed	Port No.	Tx Rate	Rx Rate	Link Speed
1	Full Speed	Full Speed	---	14	Full Speed	Full Speed	---
2	Full Speed	Full Speed	---	15	Full Speed	Full Speed	---
3	Full Speed	Full Speed	---	16	Full Speed	Full Speed	---
4	Full Speed	Full Speed	---	17	Full Speed	Full Speed	---
5	Full Speed	Full Speed	---	18	Full Speed	Full Speed	---
6	Full Speed	Full Speed	---	19	Full Speed	Full Speed	---
7	Full Speed	Full Speed	---	20	Full Speed	Full Speed	100M
8	Full Speed	Full Speed	---	21	Full Speed	Full Speed	---
9	Full Speed	Full Speed	---	22	Full Speed	Full Speed	---
10	Full Speed	Full Speed	---	23	Full Speed	Full Speed	---
11	Full Speed	Full Speed	---	24	Full Speed	Full Speed	---
12	Full Speed	Full Speed	---	25	Full Speed	Full Speed	---
13	Full Speed	Full Speed	---	26	Full Speed	Full Speed	---

Figure 19 - Bandwidth summary

4.3.1. Broadcast Storm Control

The switch implements a broadcast storm control mechanism. Check the ports in the row **Enable Port** to select ports that will drop incoming

broadcast packets if the number of received broadcast packets reaches the threshold defined. Each port's broadcast storm protection function can be enabled individually.

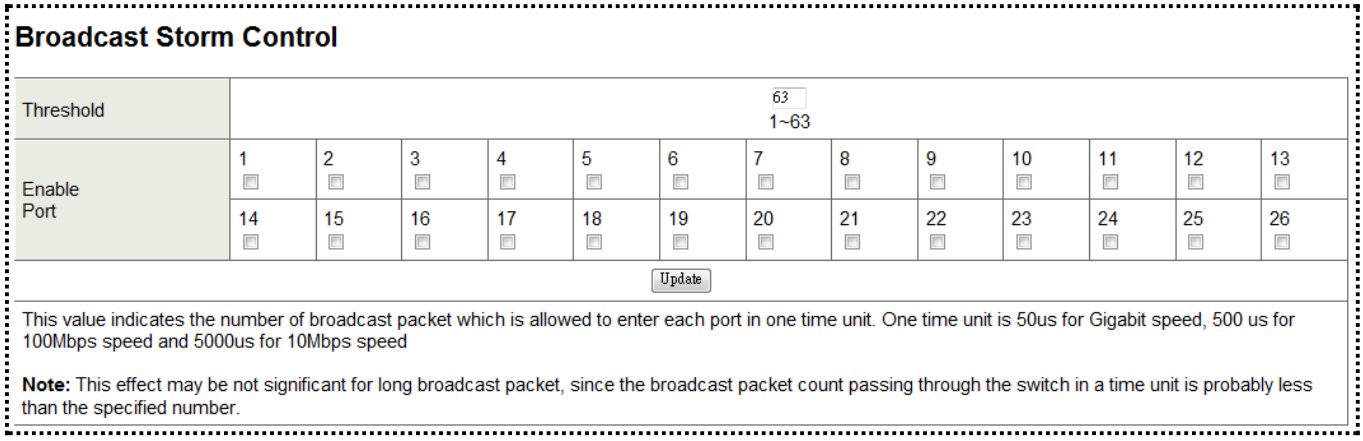

Broadcast Storm Control
Threshold
63
1~63
Enable Port
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
Update
This value indicates the number of broadcast packet which is allowed to enter each port in one time unit. One time unit is 50us for Gigabit speed, 500 us for 100Mbps speed and 5000us for 10Mbps speed
Note: This effect may be not significant for long broadcast packet, since the broadcast packet count passing through the switch in a time unit is probably less than the specified number.

Figure 20 - Broadcast storm control screen

Broadcast packets are only checked at selected ports. Timing is set to 500 us for 10Mbps speed and 5ms for 100Mbps. Excess broadcast packets will be discarded. Packets for un-selected ports are treated as normal traffic.

- Threshold: Type in a threshold between ***1*** and ***63*** to limit the maximum byte counts which a port can send or receive during a period of time.
- Enable Port: Checked ports will stop transmitting or receiving data when their thresholds given in Threshold are reached. Unchecked ports will function normally.

Click **Update** to save your changes.

4.4. PoE Settings

Various PoE settings can be set here. For more information about PoE, read the Appendix section "PoE Provisioning Process."

4.4.1. PoE Introduction

Based on the global standard IEEE 802.3af, PoE is a technology for wired Ethernet. PoE allows the electrical power necessary for the operation of each end-device (IP Cameras, VoIP phones, etc) to be carried by data cables rather than by separate power cords. Such a network configuration helps enterprises improve productivity by minimizing the number of wires that must be used to install the network, thus incurring lower cost, and less power failures. In the case of surveillance technology, IP cameras and access systems may be installed throughout a facility without incurring costs associated with hiring an electrician.

Providing up to 24 PoE, in-line power interface, the switch can easily build a power central-controlled IP phone system, IP Camera system or AP group for the enterprise. For instance, 24 camera / AP can be easily installed around the corner in the company for surveillance demands or build a wireless roaming environment in the office. Without the power-socket limitation, the PoE Switch makes the installation of cameras or WLAN AP easy and efficient.

POE Configuration

Port	1	2	3	4	5	6	7	8
Enable	☑	☑	☑	☑	☑	☑	☑	☑
Output Power	3886 mW	2146 mW	3828 mW	2204 mW	2146 mW	2320 mW	2204 mW	2378 mW
POE Class	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2
Port	09	10	11	12	13	14	15	16
Enable	☑	☑	☑	☑	☑	☑	☑	☑
Output Power	2204 mW	3944 mW	2320 mW	3828 mW	2320 mW	3886 mW	3770 mW	2320 mW
POE Class	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2
Port	17	18	19	20	21	22	23	24
Enable	☑	☑	☑	☑	☑	☑	☑	☑
Output Power	2320 mW	3886 mW	2378 mW	2146 mW	2262 mW	2262 mW	3770 mW	2320 mW
POE Class	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2	Class 2

Update

Update: Update the power control funtion.
Enable ☑ **:**Power On
Enable ☐ **:**Power Off

Figure 21 - PoE Configuration screen

This page displays PoE information about a port's Output Power and PoE Class. Check **Enable** to use the port for PoE.

5. VLAN SETTING

5.1. Introduction to VLAN

A Virtual Local Area Network (VLAN) is a network topology configured according to a logical scheme rather than the physical location. VLAN can be used to combine any collection of LAN segments into an autonomous user group that appears as a single LAN. VLAN also logically segment the network into different broadcast domains so that packets are forwarded only between ports within the VLAN. Typically, a VLAN corresponds to a particular subnet, although not necessarily.

VLAN can enhance performance by conserving bandwidth, and improve security by limiting traffic to specific domains.

End nodes that frequently communicate with each other are assigned to the same VLAN, regardless of where they are physically on the network. Logically, a VLAN can be equated to a broadcast domain, because broadcast packets are forwarded to only members of the VLAN on which the broadcast was initiated.

No matter what basis is used to uniquely identify end nodes and assign these nodes VLAN membership, packets cannot cross VLAN without a network device performing a routing function between the VLAN.

5.1.2. IEEE 802.1Q Standard

IEEE 802.1Q (tagged) VLAN is implemented on the Switch. 802.1Q VLAN require tagging, which enables them to span the entire network (assuming all switches on the network are IEEE 802.1Q-compliant).

VLANs allow a network to be segmented in order to reduce the size of broadcast domains. All packets entering a VLAN will only be forwarded to IEEE 802.1Q enabled switches that are members of that VLAN, including broadcast, multicast and unicast packets from unknown sources.

VLAN can also provide a level of security to your network. IEEE 802.1Q VLAN will only deliver packets between stations that are members of the VLAN. Any port can be configured as either tagging or untagging.

- The untagging feature of IEEE 802.1Q VLAN allows a VLAN to work with legacy switches not recognizing VLAN tags in packet headers.
- The tagging feature allows VLAN to span multiple 802.1Q-compliant switches through a single physical connection and allows Spanning Tree to be enabled and working normally on all ports.

Some relevant terms:

- Tagging: The act of putting 802.1Q VLAN information into the packet header.
- Untagging: The act of stripping 802.1Q VLAN information out of the packet header.

802.1Q VLAN Tags

The figure below shows the 802.1Q VLAN tag. There are four additional octets inserted after the source MAC address. Their presence is

indicated by a value of 0x8100 in the Ether Type field. When a packet's Ether Type field is equal to 0x8100, the packet carries the IEEE 802.1Q/802.1p tag. The tag is contained in the following two octets and consists of 3 bits of user priority, 1 bit of Canonical Format Identifier (CFI - used for encapsulating Token Ring packets so they can be carried across Ethernet backbones), and 12 bits of VLAN ID (VID). The 3 bits of user priority are used by 802.1p. The VID is the VLAN identifier and is used by the 802.1Q standard. Because the VID is 12 bits long, 4094 unique VLAN can be identified.

The tag is inserted into the packet header making the entire packet longer by 4 octets. All of the information originally contained in the packet is retained.

The Ether Type and VLAN ID are inserted after the MAC source address, but before the original Ether Type/Length or Logical Link Control. Because the packet is now a bit longer than it was originally, the Cyclic Redundancy Check (CRC) must be recalculated.

Port VLAN ID

Tagged packets (carrying the 802.1Q VID information) can be transmitted from one 802.1Q compliant network device to another with VLAN information intact. This allows 802.1Q VLANs to span network devices or even the entire network provided that all network devices are 802.1Q compliant.

All physical ports on a switch have a PVID. 802.1Q ports are also assigned a PVID for use within the switch. If no VLANs are defined on the switch, all ports are then assigned to a default VLAN with a PVID equal to 1. Any untagged packet is assigned the PVID of the port on which they were received. Forwarding decisions are based upon this PVID in so far as VLAN are concerned. Tagged packets are forwarded according to the VID contained within the tag. Tagged packets are also assigned a PVID, but the VID is used to make packet forwarding decisions, rather than the PVID.

Tag-aware switches must keep a table to relate PVID within the switch to a network VID. The switch will compare the VID of a packet to be transmitted to the VID of the port that is to transmit the packet. If the two VIDs are different the switch, the packet is dropped. Because of the existence of the PVID for untagged packets and the VID for tagged packets, tag-aware and tag-unaware network devices are allowed to coexist on the same network.

A switch port can have only one PVID, but can have as many VIDs as the switch has memory in its VLAN table to store them.

Because some devices on a network may be tag-unaware, a decision must be made at each port on a tag-aware device before packets are transmitted. If the transmitting port is connected to a tag-unaware device, the packet should be untagged. If the transmitting port is connected to a tag-aware device, the packet should be tagged.

Untagged VLANs

Untagged (or static) VLANs are typically used to reduce broadcast traffic and to increase security. A group of network users assigned to a VLAN form a broadcast domain that is separate from other VLANs configured on the switch. Packets are forwarded only between ports that are designated for the same VLAN. Untagged VLANs can be used to manually isolate user groups or subnets.

5.2. VLAN Configuration

To access VLAN options, click on the link VLAN Configuration in the navigation pane of the web interface.

5.2.1. VLAN Mode

Figure 22 - Toggle between VLAN modes

You may select the VLAN Mode of the switch. Port-based VLAN groups traffic onto a single switch. There is no handover of network traffic within VLAN groups to other switches. For the handover to other switches use Tag Based VLAN. In VLAN Mode you can switch from Tag to Port Based VLAN. Port Based VLAN is the default mode. Click **Change VLAN mode** to change the mode.

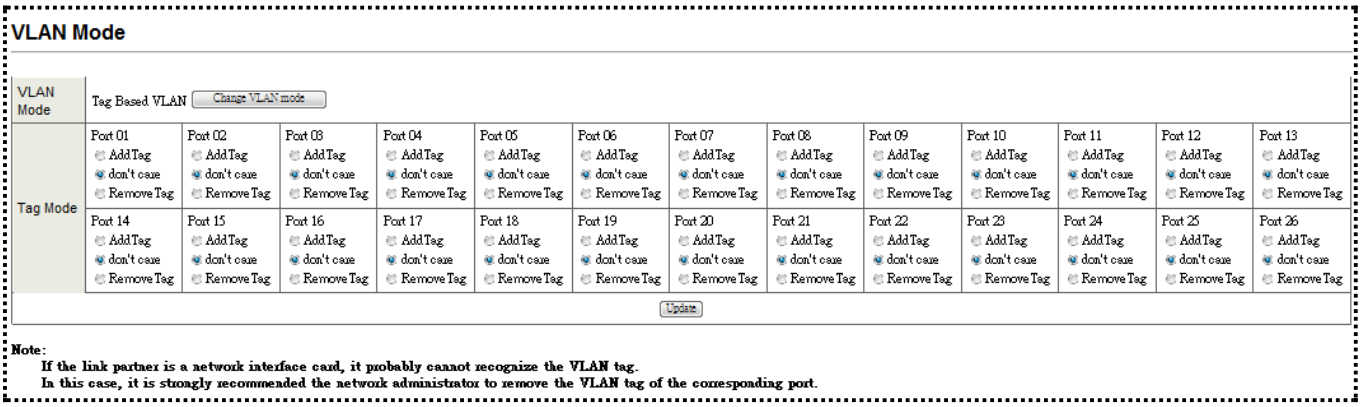

VLAN Mode
VLAN Mode
Tag Based VLAN
Change VLAN mode
Tag Mode
Port 01 Port 02 Port 03 Port 04 Port 05 Port 06 Port 07 Port 08 Port 09 Port 10 Port 11 Port 12 Port 13
Port 14 Port 15 Port 16 Port 17 Port 18 Port 19 Port 20 Port 21 Port 22 Port 23 Port 24 Port 25 Port 26
Add Tag
don't care
Remove Tag
Update
Note:
If the link partner is a network interface card, it probably cannot recognize the VLAN tag.
In this case, it is strongly recommended the network administrator to remove the VLAN tag of the corresponding port.

Figure 23 – Select options for VLAN

On this screen you can now define and configure your Up- and Downlink ports. These are important since here the handover between the switches of your network takes place.

- VLAN Mode: Displays VLAN mode: port based/Tag based VLAN. Here you can also switch back to Port Based VLAN Mode
  - **Add tag** means the outgoing packet of the selected port will be inserted with an 802.1Q tag. Use this setting for your Up- and Downlink Ports in your VLAN Tagged Network.
  - **Don't care** means the outgoing packet of the selected port keep the original packet received at the source port. This is the default setting when starting VLAN configuration. It is recommended that the option be changed to **Add** or **Remove Tag**.
  - **Remove tag** means the 802.1Q tag of the outgoing packet of the selected port will not be sent. Use this setting for your Network Connections to PCs. Only packets of the VLAN Group the Port is member of will be sent.

5.2.2. VLAN Member

The ports need to be made member of your VLAN groups. This is for Tag Based and Port Based VLAN Mode. The screen here looks different whether you run Tag Based or Port Based Mode.

VLAN Member in Port Based Mode

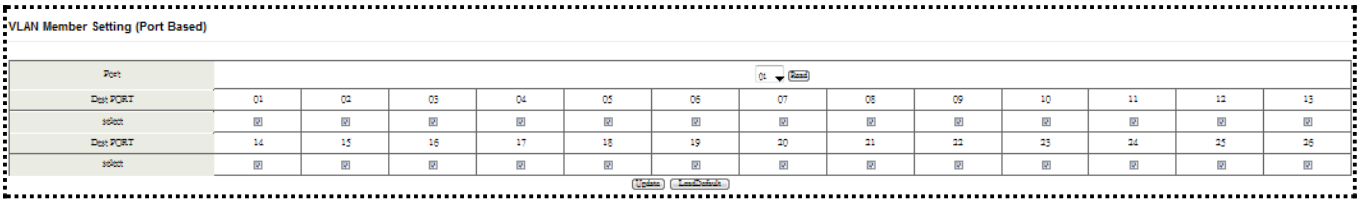


Figure 24 – Group ports for port-based VLAN mode

In Port Based Mode you see a matrix of your Ports. Simply select the port on top screen you want to configure, click on **Read**, and then select or deselect the ports that are on the same VLAN group. In this configuration mode you do not need to worry about defining VLAN groups and VLAN IDs.

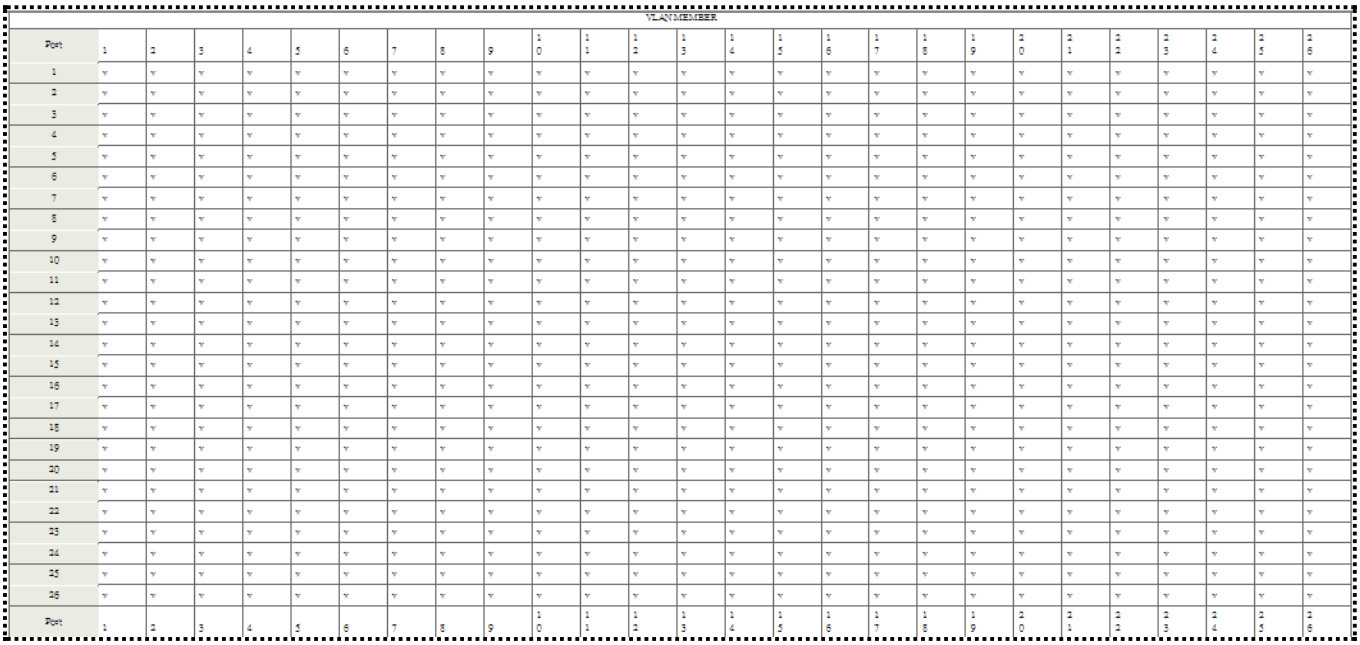
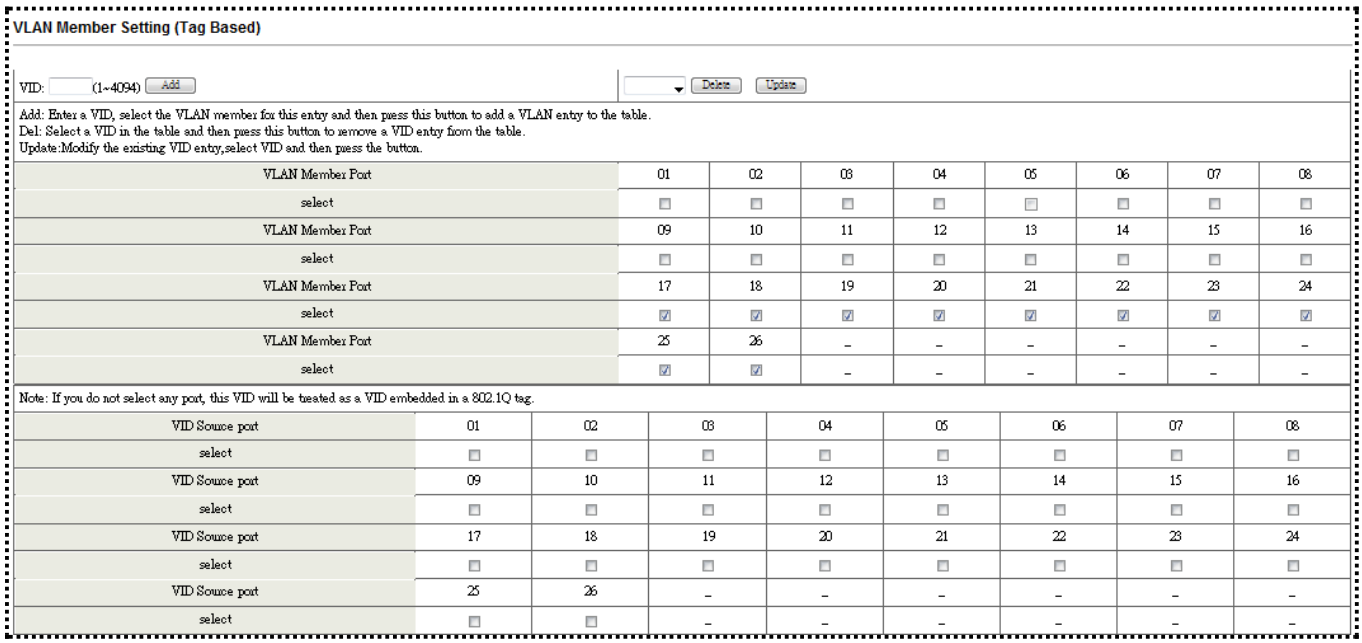


Figure 25 - A summary of VLAN groups

VLAN Member in Tag Based Mode

In Tag Based Mode you need to define and configure your VLAN groups. To ensure smooth handover, the VLAN IDs (Numbers) need to be like on the rest of your network.

Add VLAN Groups (identified throughout your network by unique and constant numbers). Start with IDs from 100 and up. Keep in mind that some switches use "1" as the default, while others use "4095" or "4096" as default. Starting with 100 gives you enough free room and less compatibility issues.



VLAN Member Setting (Tag Based)

VID: (1~4094) Add | Delete | Update

Add: Enter a VID, select the VLAN member for this entry and then press this button to add a VLAN entry to the table.
Del: Select a VID in the table and then press this button to remove a VID entry from the table.
Update:Modify the existing VID entry,select VID and then press the button.

VLAN Member Port	01	02	03	04	05	06	07	08
select	☐	☐	☐	☐	☐	☐	☐	☐
VLAN Member Port	09	10	11	12	13	14	15	16
select	☐	☐	☐	☐	☐	☐	☐	☐
VLAN Member Port	17	18	19	20	21	22	23	24
select	☑	☑	☑	☑	☑	☑	☑	☑
VLAN Member Port	25	26	_	_	_	_	_	_
select	☑	☑	_	_	_	_	_	_

Note: If you do not select any port, this VID will be treated as a VID embedded in a 802.1Q tag.

VID Source port	01	02	03	04	05	06	07	08
select	☐	☐	☐	☐	☐	☐	☐	☐
VID Source port	09	10	11	12	13	14	15	16
select	☐	☐	☐	☐	☐	☐	☐	☐
VID Source port	17	18	19	20	21	22	23	24
select	☐	☐	☐	☐	☐	☐	☐	☐
VID Source port	25	26	_	_	_	_	_	_
select	☐	☐	_	_	_	_	_	_

Figure 26 - Tag settings

Enter 100 in the field right of VID Setting, then select or deselect which ports are member of that group. Bear in mind that the up- and downlink ports need to contain members of every existing group. When the ports are assigned, click **Add**. The new group with its setting will be displayed at the bottom of the screen.

With the PVID Setting define to which VLAN group incoming traffic belongs. For example, port 1 is a member of group 100 and 101. A simple PC is connected to Port 1. If that PC is now sending out data, with PVID you define if that data is for group 100 or 101.

A summary of VLANs can be seen as shown in the screen below.

Port VID Map.

Port	01	02	03	04	05	06	07	08
VID	—	—	—	—	—	—	—	—
Port	09	10	11	12	13	14	15	16
VID	—	—	—	—	—	—	—	—
Port	17	18	19	20	21	22	23	24
VID	—	—	—	—	—	—	—	—
Port	25	26	_	_	_	_	_	_
VID	—	—	_	_	_	_	_	_

VLAN MEMBER

VID \ Port	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Figure 27 - Ports and their VLAN IDs

5.3. Multi to 1 Setting

Multi to 1 VLAN is used in the CPE side of Ethernet-to-the-Home. When VLAN member Settings is updated, multi to 1 setting will be negated. Disabling the port excludes it from this action. All ports excluded in this setting are treated as the same VLAN group. In a normal Tag Based VLAN network this configuration option is not necessary.

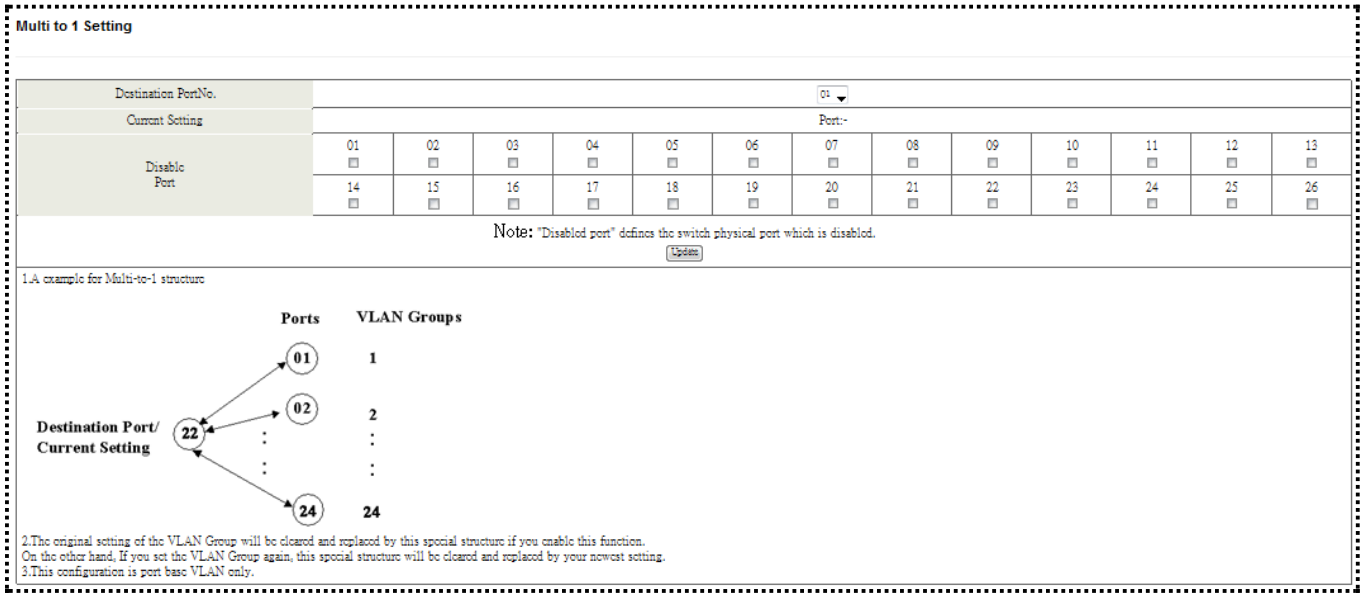

Multi to 1 Setting
Destination PortNo.
Current Setting
Port:-
Disable Port
01 02 03 04 05 06 07 08 09 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
Note: "Disabled port" defines the switch physical port which is disabled.
Update
1.A example for Multi-to-1 structure
Ports
VLAN Groups
01
02
22
24
1
2
24
Destination Port/
Current Setting
2.The original setting of the VLAN Group will be cleared and replaced by this special structure if you enable this function.
On the other hand, If you set the VLAN Group again, this special structure will be cleared and replaced by your newest setting.
3.This configuration is port base VLAN only.

Figure 28 - Multi to 1 setting screen

6. PER PORT COUNTER

Port Counter

To access port statistics, click on the link Port Counter in the navigation pane of the web interface. This page provides statistics on each port. Figures are grouped into four categories: **Receive Packet & Transmit Packet/ Transmit & Collision / Receive Packet & Drop /Receive & CRC error.** Select the category in the **Counter Mode Selection** drop-down list. Once you change the counter category, the counter will be cleared automatically.

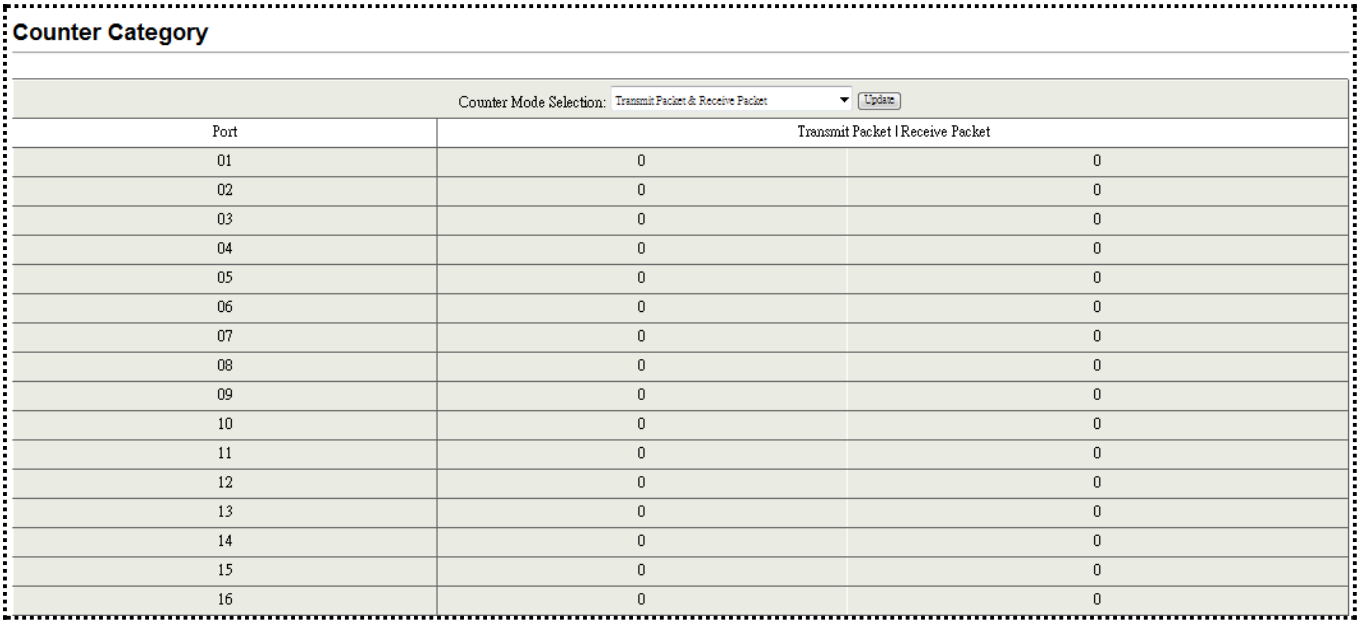


Figure 29 - The "Transmit & Receive Packet" screen of Per Port Counter

- Transmit packet & Receive packet: Both the received packet count (excluding incorrect packets) and the transmitted packet count.
- Collision Count & Transmit packet: The packets outgoing from the switch and collisions.
- Drop packet & Receive packet: The number of received valid packet and the number of dropped packets.
- CRC packet & Receive packet: Received correct packets and Received CRC errors.
- Clear: Clicking **Clear** will clear all counters.
- Refresh: Clicking **Refresh** will update counters for all ports.

7. QoS SETTING

7.1. About QoS

Here you can configure QoS policy priority mode and CoS (Class of Service) configuration. Quality of Service (QoS) is an advanced traffic prioritization feature that allows you to establish control over network traffic. QoS enables you to assign various grades of network service to different types of traffic, such as multi-media, video, protocol-specific, time critical, and file-backup traffic. CoS refers to feature sets, or groups of services, that are assigned to users based on company policy. If a feature set includes priority transmission, then CoS winds up being implemented in QoS functions within the routers and switches in the network. In an enterprise network, class of service (CoS) differentiates high-priority traffic from lower-priority traffic. Tags may be added to the packets to identify such classes, but they do not guarantee delivery as do quality of service (QoS) functions, which are implemented in the network devices.

QoS reduces bandwidth limitations, delay, loss, and jitter. It also provides increased reliability for delivery of your data and allows you to prioritize certain applications across your network. You can define exactly how you want the switch to treat selected applications and types of traffic.

You can use QoS on your system to:

- Control a wide variety of network traffic by:
- Classifying traffic based on packet attributes.
- Assigning priorities to traffic (for example, to set higher priorities to time-critical or business-critical applications).
- Applying security policy through traffic filtering.
- Provide predictable throughput for multimedia applications such as video conferencing or voice over IP by minimizing delay and jitter.
- Improve performance for specific types of traffic and preserve performance as the amount of traffic grows.
- Reduce the need to constantly add bandwidth to the network.
- Manage network congestion.

7.2. Configuring QoS

To access QoS configuration options, click on the link ***QoS Settings*** in the navigation pane of the web interface.

7.2.1. Priority Mode

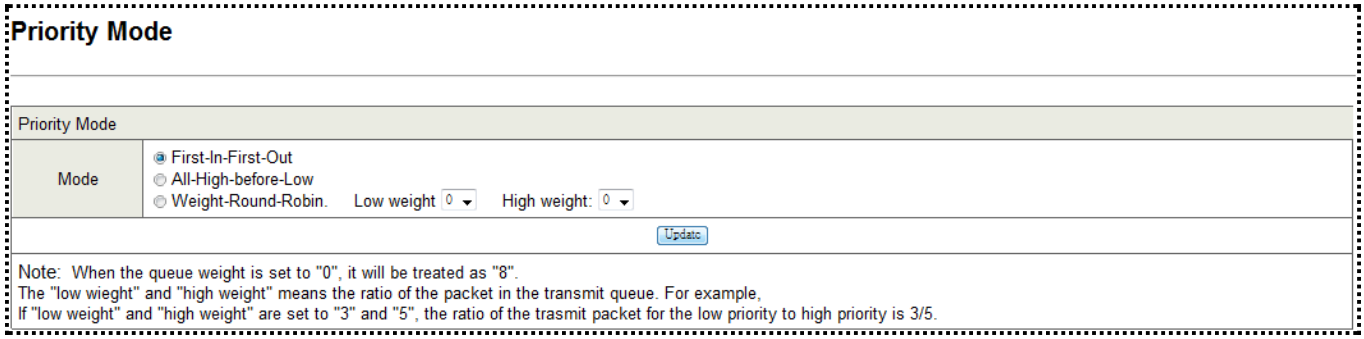

Priority Mode
Priority Mode
Mode
First-In-First-Out
All-High-before-Low
Weight-Round-Robin.
Low weight 0
High weight: 0
Update
Note: When the queue weight is set to "0", it will be treated as "8".
The "low wieght" and "high weight" means the ratio of the packet in the transmit queue. For example,
If "low weight" and "high weight" are set to "3" and "5", the ratio of the trasmit packet for the low priority to high priority is 3/5.

Figure 30 - Select different modes

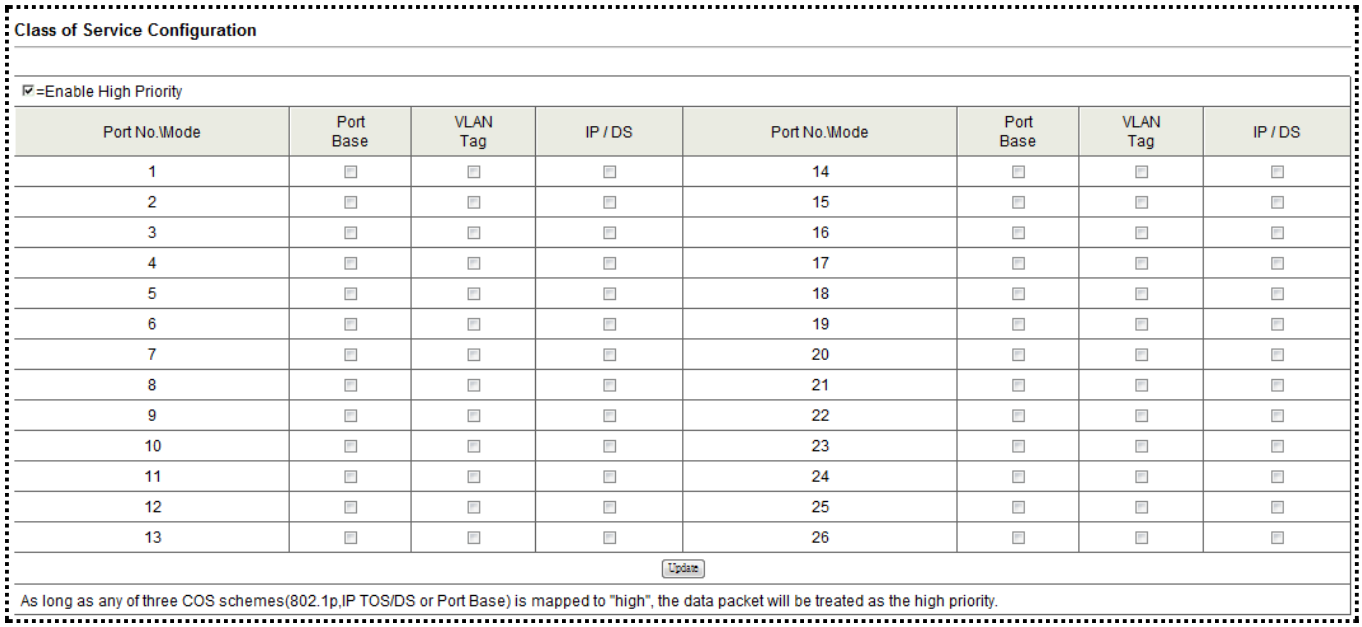
There are three priority modes available to specify the priority of packets being serviced:

- First-In-First-Out: Packets are placed into the queue and serviced in the order they were received.
- All-high-before-low (Strict priority): All packets will be assigned to either a high priority queue (Queue 2) or a low priority queue (Queue 1). The packet on the low priority queue will not be forwarded until the high priority queue is empty.
- WRR mode: There are 4 priority queues for Weighted-and-round-robin (WRR) mode. When this mode is selected, the traffic will be forwarded according to the number set in each queue.

Click **Update** to save your changes.

7.2.2. Port, 802.1p, IP/DS based

Note that checking Port Base, VLAN Tag or IP/DS will cause the port checked to be treated as high priority. Click **Update** to save your changes.



Class of Service Configuration

☑=Enable High Priority

Port No.\Mode	Port Base	VLAN Tag	IP / DS	Port No.\Mode	Port Base	VLAN Tag	IP / DS
1	☐	☐	☐	14	☐	☐	☐
2	☐	☐	☐	15	☐	☐	☐
3	☐	☐	☐	16	☐	☐	☐
4	☐	☐	☐	17	☐	☐	☐
5	☐	☐	☐	18	☐	☐	☐
6	☐	☐	☐	19	☐	☐	☐
7	☐	☐	☐	20	☐	☐	☐
8	☐	☐	☐	21	☐	☐	☐
9	☐	☐	☐	22	☐	☐	☐
10	☐	☐	☐	23	☐	☐	☐
11	☐	☐	☐	24	☐	☐	☐
12	☐	☐	☐	25	☐	☐	☐
13	☐	☐	☐	26	☐	☐	☐

Update

As long as any of three COS schemes(802.1p,IP TOS/DS or Port Base) is mapped to "high", the data packet will be treated as the high priority.

Figure 31 - Choose a Class of Service

8. SECURITY

To access security options, click on the link ***Security*** in the navigation pane of the web interface.

8.1. MAC Address Binding

Setting a MAC address allows interfaces to be uniquely identified on your network.

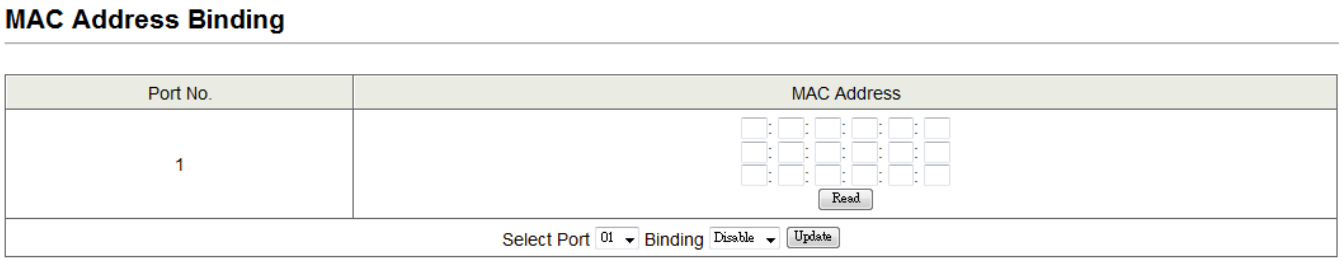

MAC Address Binding
Port No.
MAC Address
1
Read
Select Port 01 Binding Disable Update
Note: If you enable the MAC address binding function, the address leaning function will be disabled automatically.

Figure 32 - Set MAC addresses for ports

Port No.	Binding Status	Port No.	Binding Status
1	Disable	14	Disable
2	Disable	15	Disable
3	Disable	16	Disable
4	Disable	17	Disable
5	Disable	18	Disable
6	Disable	19	Disable
7	Disable	20	Disable
8	Disable	21	Disable
9	Disable	22	Disable
10	Disable	23	Disable
11	Disable	24	Disable
12	Disable	25	Disable
13	Disable	26	Disable

Note: The MAC address of current management connection is 00:26:6c:48:af:57 at port 20.

- Port No: Displays the port number being assigned the MAC addresses.
- MAC Address: Assign up to 3 MAC addresses to the port.
- Read: Click the read button to show the MAC addresses bound with a specified port or modify the MAC addresses.
- Select Port: Use the drop-down menu to choose a port number to be set.
- Binding: Select to ***Enable*** or ***Disable*** for the binding function.

Click **Update** to save your changes.

8.2. TCP/UDP Filter

Filter different types of connections to the network on this page.

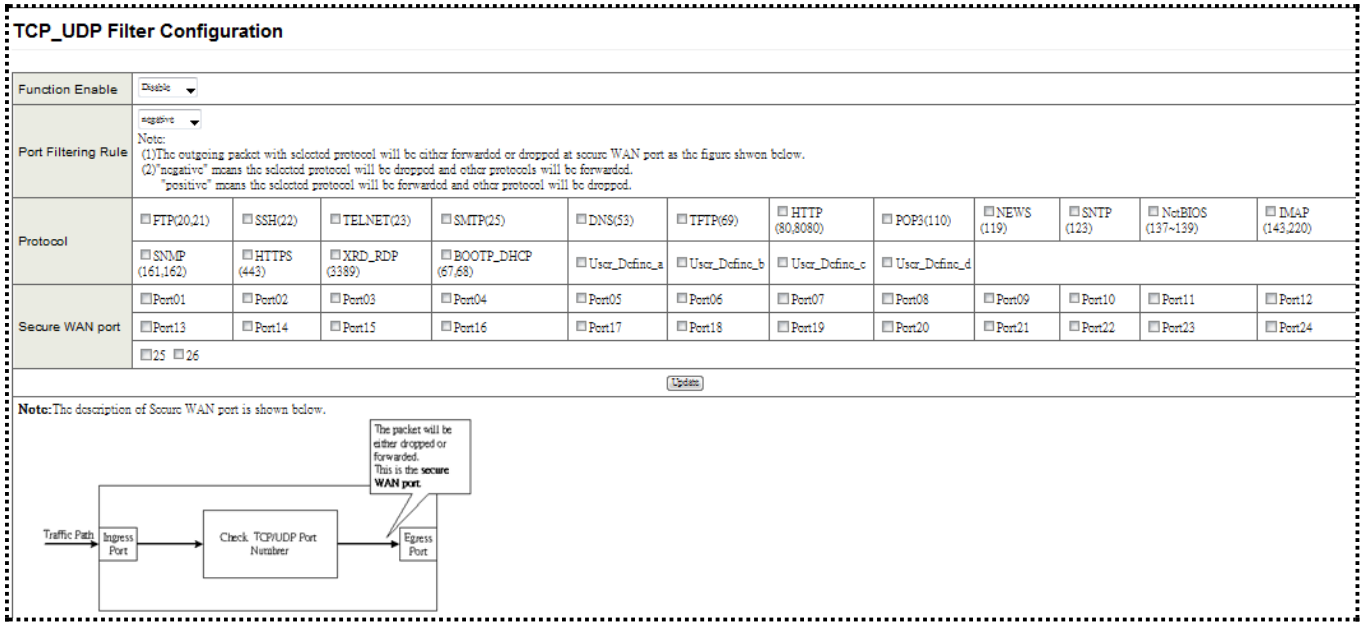


Figure 33 - Filter ingoing and outgoing connections

- Function Enable: ***Enable*** or ***Disable*** filtering.
- Port Filtering Rule: To allow forwarding (do not filter) select ***negative*** in the drop-down menu and in the Protocol section, select ports to forward. To disallow forwarding (filter) select ***positive*** in the drop-down menu and in the Protocol section, select ports to filter.
- Protocol: Check the protocols to filter/forward.
- Secure WAN port: Select the port on which WAN traffic is to be sent through.

Click **Update** to save your changes.

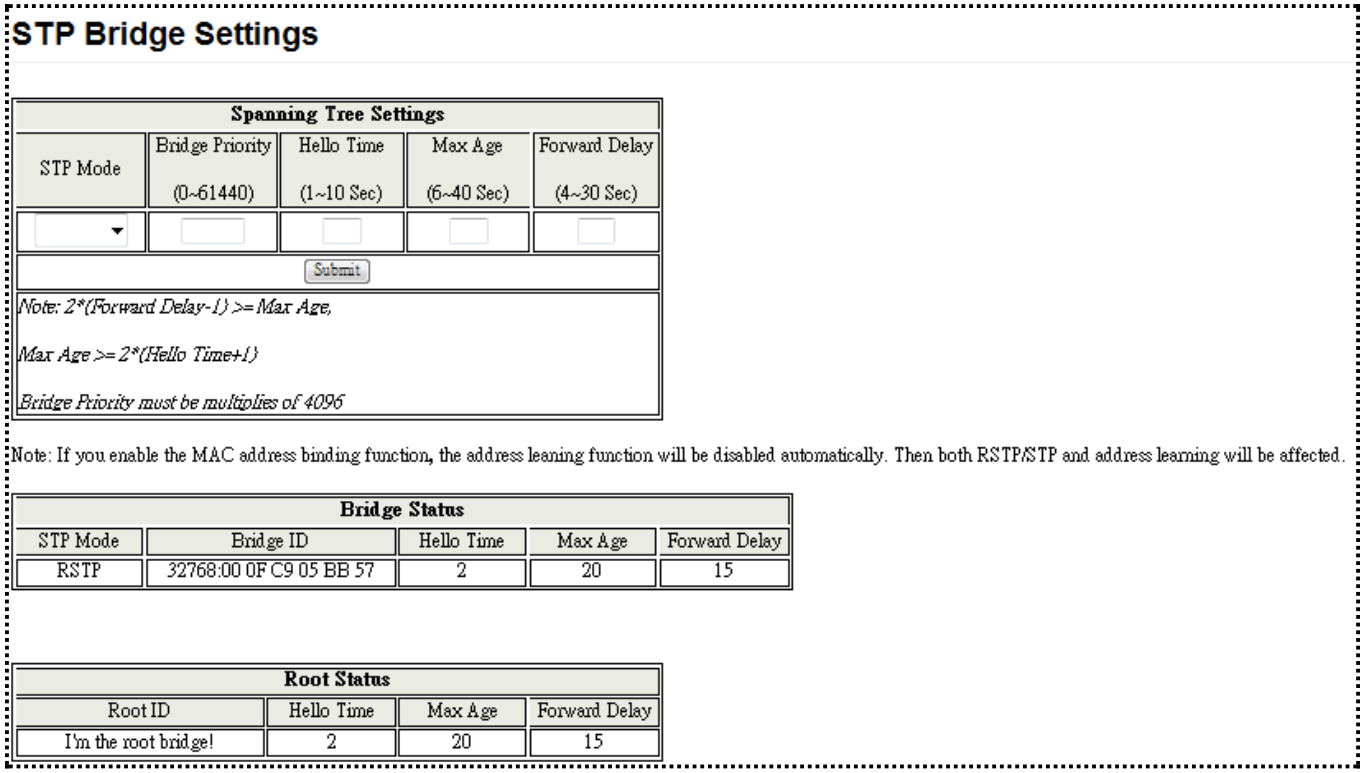
9. SPANNING TREE PROTOCOL

The Spanning Tree protocol can be used to detect and disable network loops, and to provide backup links between switches, bridges or routers. This allows the switch to interact with other bridging devices in your network to ensure that only one route exists between any two stations on the network, and provide backup links which automatically take over when a primary link goes down.

The Protocol allows for the blocking of links between switches that form loops within the network. When multiple links between switches are detected, a primary link is established. Duplicated links are blocked from use and become standby links. The protocol allows for the duplicate links to be used in the event of a failure of the primary link. Once the Spanning Tree Protocol is configured and enabled, primary links are established and duplicated links are blocked automatically. The reactivation of the blocked links (at the time of a primary link failure) is also accomplished automatically without operator intervention.

To access Spanning Tree options, click on the link ***Spanning Tree*** in the navigation pane of the web interface.

9.1. STP Bridge Settings



- Bridge Priority: This parameter configures the spanning tree priority globally for this switch. The device with the highest priority becomes the STP root device. However, if all devices have the same priority, the device with the lowest MAC address will then become the root device. A number selected should be between 0 and 61440 in increments of 4096.
- Hello Time: Interval (in seconds) at which the root device transmits a configuration message (BPDU frame). Select a number between ***1*** and ***10*** (default is ***2***).
- Max Age – The maximum time (in seconds) a device can wait without receiving a configuration message before attempting to reconfigure. That also means the maximum life time for a BPDU frame. Select a number between ***6*** and ***40*** (default is ***20***).

Forward Delay: The maximum time (in seconds) the root device will wait before changing states (i.e., discarding to learning to forwarding).

Choose a number from 4 to 30 (default is 15).

Click **Submit** to save your changes.

9.2. STP Port Settings

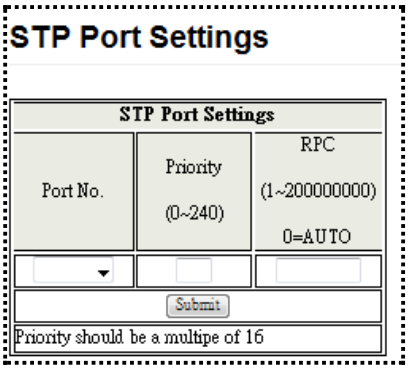


Figure 34 - Settings per port

- Port No: The port ID. It cannot be changed. Aggregations refer to any configured trunk group.
- Root Path Cost: This parameter is used by the STP to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media. Set the RSTP path cost on the port between ***0*** and ***200000000***. ***0*** indicates an automatically calculated path cost.
- State: Displays whether a port is a designated, root or blocked port.
- Status: Displays the transmission status of the port, i.e. forwarding, disabled etc…

Click **Update** to save your changes.

9.3. Loopback Detection Settings

This function detects the presence of network traffic routed back to its source. The status for all ports is given.

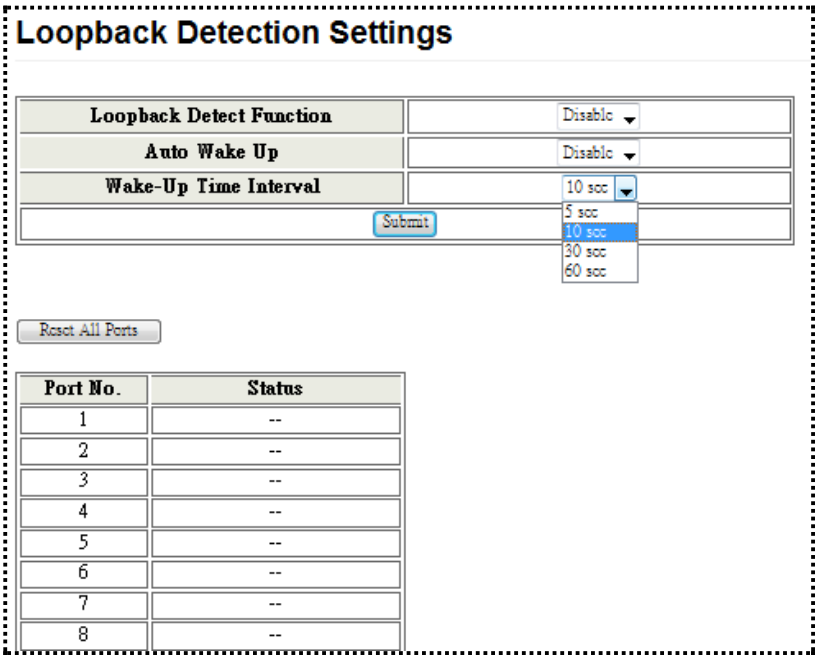


Figure 35 - Loopback detection settings screen

- Loopback Detect Function: Choose whether to ***Enable*** or ***Disable*** this function.
- Auto Wake Up: Determine whether or not the controller is set to wake up or not.
- Wake-Up Time Interval: Specify duration in the drop-down menu.

Click **Update** to save your changes.

10. TRUNKING

Port trunk allows multiple links to be bundled together and act as a single physical link for increased throughput. It provides load balancing, and redundancy of links in a switched network. As such, the link does not have an inherent total bandwidth equal to the sum of its component physical links. Traffic in a trunk is distributed across an individual link within the trunk in a as determined by a hash algorithm. The hash algorithm automatically applies load balancing to the ports in the trunk. A port failure within the trunk group causes the network traffic to be directed to the remaining ports. Load balancing is maintained whenever a link in a trunk is lost or returned to service. This switch may use Port ID, Source MAC Address, Destination MAC Address, or a combination of Source MAC Address and Destination MAC Address as the selecting factor for this algorithm. The Traffic pattern on the network should be considered carefully before applying it. When a proper hash algorithm is used network traffic will be load-balanced and transmitted across any link within the trunk.

To access Trunking options, click on the link ***Trunking*** in the navigation pane of the web interface.

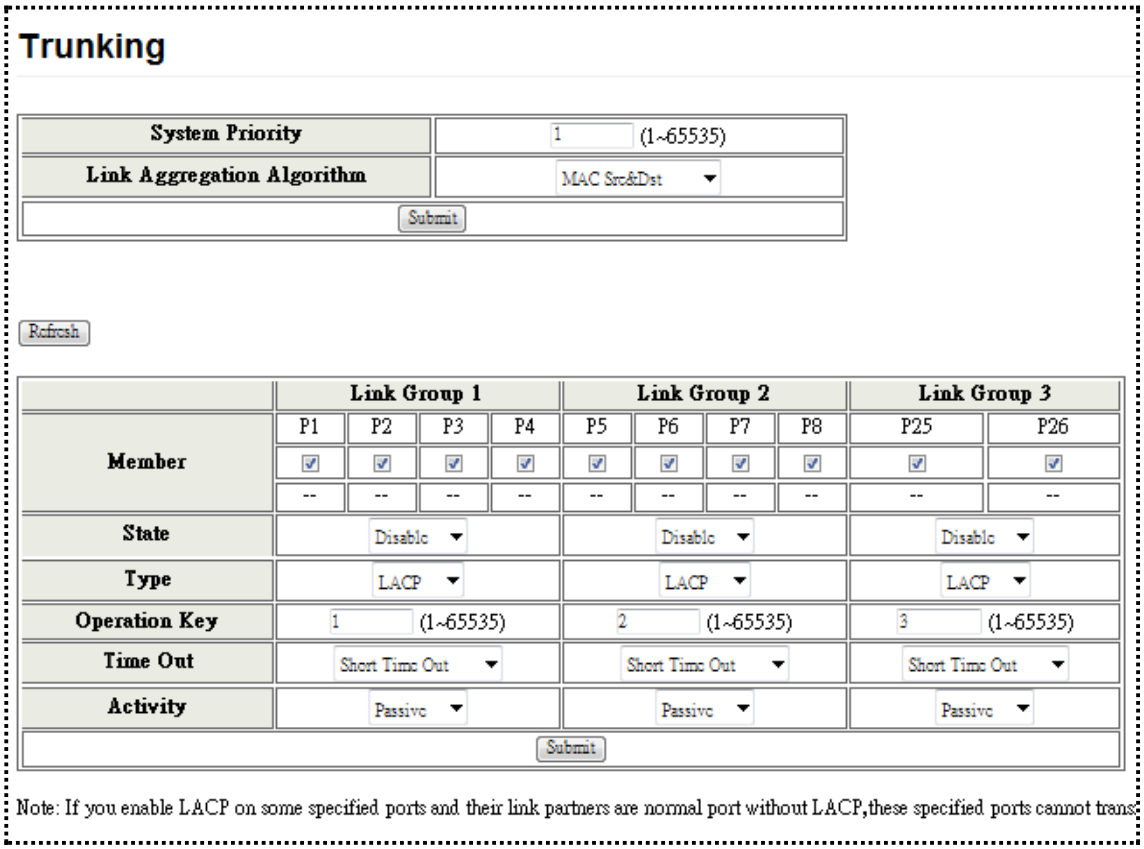


Figure 36 - Trunking screen

This managed switch supports two trunk group, each trunk consists of 2~4 ports.

- System Priority: Specify a priority between ***1*** and ***65535***.
- Link Aggregation Algorithm: Use either ***Port ID***, ***Source MAC Address***, ***Destination MAC Address*** or ***MAC Src&Dst*** (Source and Destination).

Click **Submit**

- Member: Group the links by checking on their checkboxes. Up to three links may be made.

- State: ***Enable*** or ***Disable*** trunking.
- Type: Choose the Trunking type.
- Operation Key: Specify a number from ***1*** to ***65535***.
- Time Out: Choose between durations in the drop-down menu.
- Activity: Select a mode in the drop-down menu.

Click **Update** to save your changes.

11. BACKUP/RECOVERY

To access backup and recovery options, click on the link ***Backup/Recovery*** in the navigation pane of the web interface.

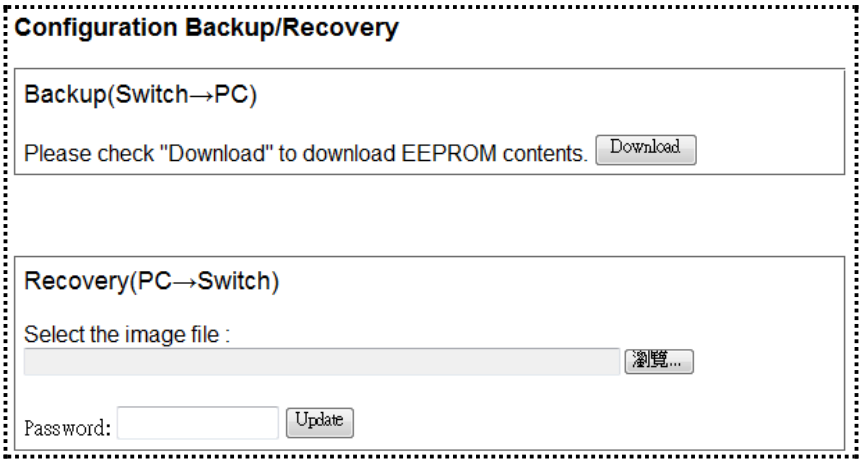


Figure 37 - Backup and Recovery options

This function provides the user with a method to backup/recover switch configuration. Save a configuration file by clicking Download. This will save a file of current settings. To recover a configuration, type its path into the field and enter the administrator password. Click **Update** to save your changes.

12. MISCELLANEOUS SETTINGS

Miscellaneous settings can be used to configure output queue aging time, VLAN stride and IGMP snooping.

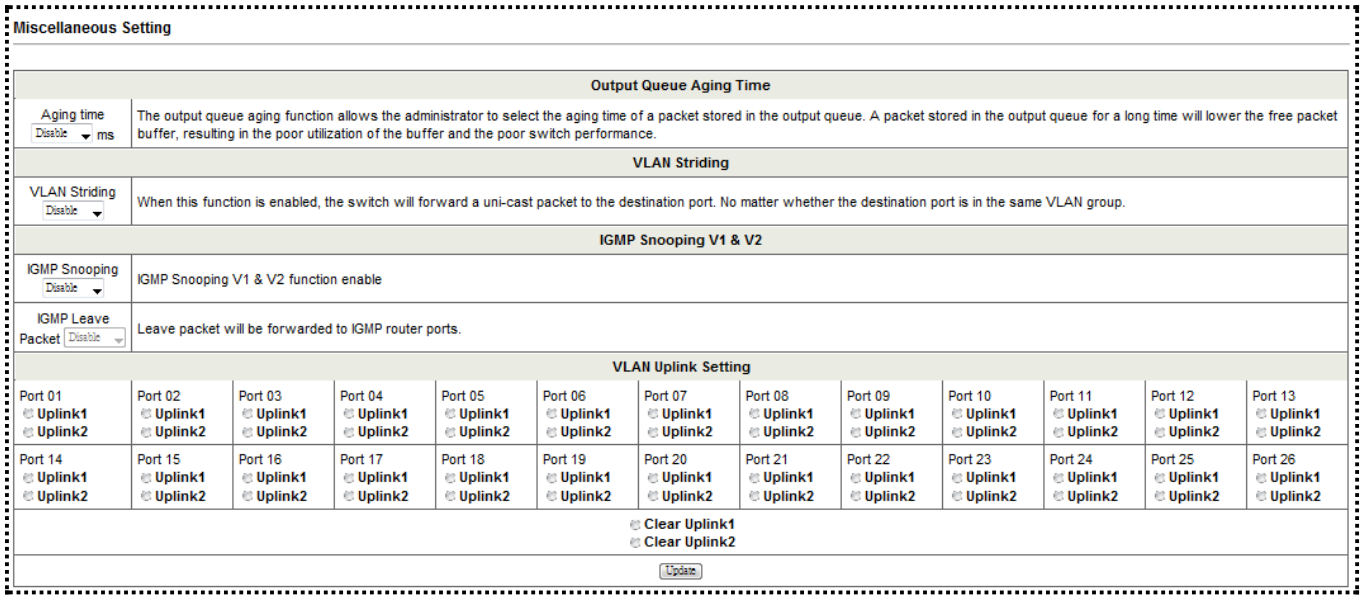

Miscellaneous Setting
Output Queue Aging Time
Aging time
Disable
ms
The output queue aging function allows the administrator to select the aging time of a packet stored in the output queue. A packet stored in the output queue for a long time will lower the free packet buffer, resulting in the poor utilization of the buffer and the poor switch performance.
VLAN Striding
VLAN Striding
Disable
When this function is enabled, the switch will forward a uni-cast packet to the destination port. No matter whether the destination port is in the same VLAN group.
IGMP Snooping V1 & V2
IGMP Snooping
Disable
IGMP Snooping V1 & V2 function enable
IGMP Leave Packet
Disable
Leave packet will be forwarded to IGMP router ports.
VLAN Uplink Setting
Port 01 Uplink1 Uplink2
Port 02 Uplink1 Uplink2
Port 03 Uplink1 Uplink2
Port 04 Uplink1 Uplink2
Port 05 Uplink1 Uplink2
Port 06 Uplink1 Uplink2
Port 07 Uplink1 Uplink2
Port 08 Uplink1 Uplink2
Port 09 Uplink1 Uplink2
Port 10 Uplink1 Uplink2
Port 11 Uplink1 Uplink2
Port 12 Uplink1 Uplink2
Port 13 Uplink1 Uplink2
Port 14 Uplink1 Uplink2
Port 15 Uplink1 Uplink2
Port 16 Uplink1 Uplink2
Port 17 Uplink1 Uplink2
Port 18 Uplink1 Uplink2
Port 19 Uplink1 Uplink2
Port 20 Uplink1 Uplink2
Port 21 Uplink1 Uplink2
Port 22 Uplink1 Uplink2
Port 23 Uplink1 Uplink2
Port 24 Uplink1 Uplink2
Port 25 Uplink1 Uplink2
Port 26 Uplink1 Uplink2
Clear Uplink1
Clear Uplink2
Update

Figure 38 - Miscellaneous Settings

- Output queue aging: When a packet is stored in a switch for a long time, it will expire from the allowable time defined by the protocol and become a useless packet. To prevent these packets from wasting the bandwidth, this option will remove them.
- VLAN Striding: By selecting this function, uni-cast packets are forwarded to the destination port, even if the destination port is in the same VLAN.
- IGMP Snooping: The switch will execute IGMP snooping version 1 and version 2 without CPU intervention. The IGMP report and leave packets are automatically handled by the switch.
- IGMP Leave: ***Enable*** or ***Disable*** the forwarding of a Leave packet to IGMP router ports.

Click **Update** to save your changes.

13. TROUBLESHOOTING

This chapter contains information to help you solve issues that might come up while using the switch.

The Link LED is not lit

- Solution: Check the cable connection and remove duplex mode of the Ethernet Switch
-

Some stations cannot talk to other stations located on the other port

- Solution: Please check the VLAN settings, trunk settings, or port enabled / disabled status.

Performance is bad

- Solution: Check the full duplex status of the Ethernet Switch. If the Ethernet Switch is set to full duplex and the partner is set to half duplex, then the performance will be poor. Please also check the in/out rate of the port.
-

The switch will not connect to a network

- Solution: Check the LNK/ACT LED on the switch

Try another port on the Switch

- Solution:
  - Make sure the cable is installed properly
  - Make sure the cable is the right type
  - Turn off the power. After a while, turn on power again

100Base-TX port link LED is lit, but the traffic is irregular

- Solution: Check that the attached device is not set to dedicate full duplex. Some devices use a physical or software switch to change duplex modes. Auto-negotiation may not recognize this type of full-duplex setting.

Switch does not power up

- Solution:
  - The AC power cord is either not inserted or faulty; check that the AC power cord is inserted correctly and replace it if necessary.
  - Check that the AC power source is working by connecting a different device in place of the switch.

Lost admin password

- Solution: See the *Administration* section for information on how to reset the switch to factory settings.

APPENDIX A: NETWORKING HARDWARE

A.1. RJ-45 Pin Assignments

1000Mbps, 1000Base T pin assignment.

Contact	MDI	MDI-X
1	BI_DA+	BI_DB+
2	BI_DA-	BI_DB-
3	BI_DB+	BI_DA+
4	BI_DC+	BI_DD+
5	BI_DC-	BI_DD-
6	BI_DB-	BI_DA-
7	BI_DD+	BI_DC+
8	BI_DD-	BI_DC-

Table 3 - Pin assignment for 1000 Mbps, 1000 BaseT

Implicit implementation of the crossover function within a twisted-pair cable, or at a wiring panel, while not expressly forbidden, is beyond the scope of this standard.

A.2. 10/100Mbps, 10/100Base-TX

When connecting your 10/100Mbps Ethernet Switch to another switch, a bridge or a hub, a straight or crossover cable is necessary. Each port of the Switch supports auto-MDI/MDI-X detection. That means you can directly connect the Switch to any Ethernet devices without making a crossover cable. The following table and diagram show the standard RJ-45 receptacle/ connector and their pin assignments:

Contact	MDI Media Dependant Interface	MDI-X Media Dependant Interface-Cross
1	Tx + (transmit)	Rx + (receive)
2	Tx - (transmit)	Rx - (receive)
3	Rx + (receive)	Tx + (transmit)
4, 5	Not used	
6	Rx - (receive)	Tx - (transmit)
7, 8	Not used	

Table 4 - Pin assignment for 10/100 Mbps, 10/100 BaseTX

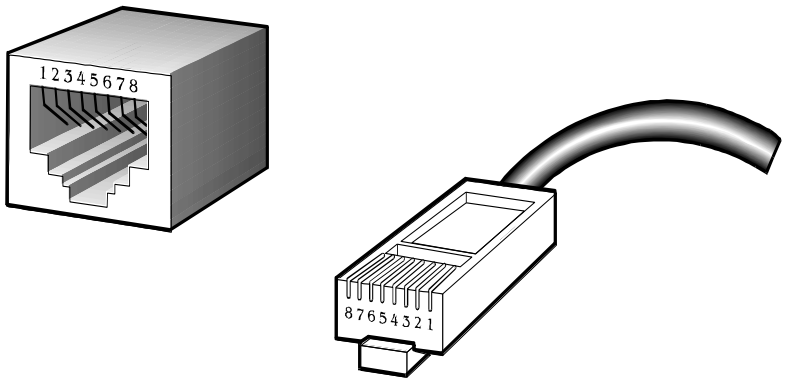


Figure 39 - RJ-45 port and connector

There are 8 wires on a standard UTP/STP cable and each wire is color-coded. The following shows the pin allocation and color of straight cable and crossover cable connection:

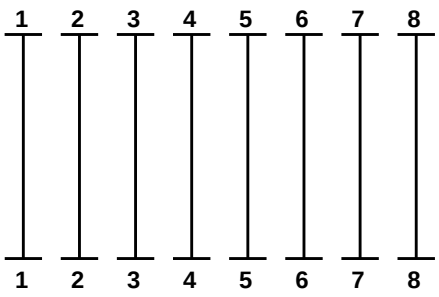
Straight Cable		SIDE 1	SIDE2
	SIDE 1	1 = White / Orange	1 = White / Orange
	SIDE 2	2 = Orange	2 = Orange
		3 = White / Green	3 = White / Green
		4 = Blue	4 = Blue
		5 = White / Blue	5 = White / Blue
		6 = Green	6 = Green
		7 = White / Brown	7 = White / Brown
		8 = Brown	8 = Brown

Table 5 - Straight through cable pins

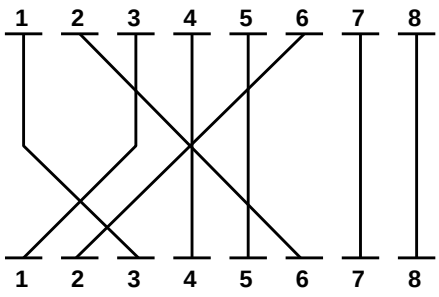
Crossover Cable		SIDE 1	SIDE2
	SIDE 1	1 = White / Orange	1 = White / Green
		2 = Orange	2 = Green
		3 = White / Green	3 = White / Orange
		4 = Blue	4 = Blue
	SIDE 2	5 = White / Blue	5 = White / Blue
		6 = Green	6 = Orange
		7 = White / Brown	7 = White / Brown
		8 = Brown	8 = Brown

Table 6 - Crossover cable pins

Please make sure your connected cables are with same pin assignment and color as above picture before deploying the cables into your network.

APPENDIX B: Store-and-Forward

Store-and-Forward is one type of packet-forwarding technique. A Store-and-Forward Ethernet switch stores the incoming frame in an internal buffer; complete error checking is done before transmission to eliminate the occurrence of error packets. This is the best choice when a network efficiency and stability are a priority.

The switch scans the destination address from the packet-header, searches the routing table provided for the incoming port and forwards the packet, only if required. The fast forwarding makes the switch ideal for connecting servers directly to the network, thereby increasing throughput and availability. However, the switch is most commonly used to segment existing hubs, which nearly always improves overall performance. An Ethernet switch can be easily configured in any network environment to significantly boost bandwidth using conventional cabling and adapters.

Due to the learning function of the switch, the source address and corresponding port number of each incoming and outgoing packet are stored in a routing table. This information is subsequently used to filter packets whose destination address is on the same segment as the source address. This confines network traffic to its respective domain and reduce the overall load on the network.

The Switch performs "Store and forward" therefore, no error packets occur. More reliably, it reduces the rate of re-transmissions. No packet loss will occur.

APPENDIX C: PoE OVERVIEW

IEEE802.3af, also called Data Terminal equipment (DTE) power via Media dependent interface (MDI), is an international standard which defines the transmission for power over Ethernet. 802.3af delivers 48V power over RJ-45 wiring. Besides 802.3af, two types of source equipment are defined: Mid-Span and End-Span.

- Mid-Span

A Mid-Span device is placed between a legacy switch and the powered device. Mid-Span taps unused wire pairs 4/5 and 7/8 to carry power. The other four are reserved for data transmission.

- End-Span

An End-Span device connects directly with a power device. End-Span devices can also tap the 1/2 and 3/6 wire pairs.

C.1. PoE System Architecture

The specification of PoE typically requires two devices: the Powered Source Equipment (PSE) and the Powered Device (PD). The PSE is either an End-Span or a Mid-Span, while the PD is a PoE-enabled terminal, such as IP Phones, Wireless LAN, etc. Power can be delivered over data pairs or spare pairs of standard CAT-5 cabling.

C.1.1. Power Transference through a CAT5 Ethernet cable

A standard CAT5 Ethernet cable has four twisted pairs, but only two of these are used for 10BASE-T and 100BASE-T specifications. The specification allows two options for using these cables for power, shown in Figure 8-1 and Figure 8-2:

The spare pairs are being used in these diagrams; Figure 8-1 shows the pair on pins 4 and 5 connected together, forming a positive supply and the pair on pins 7 and 8 connected, forming a negative supply. In actual use, either polarity may be used for power transference.

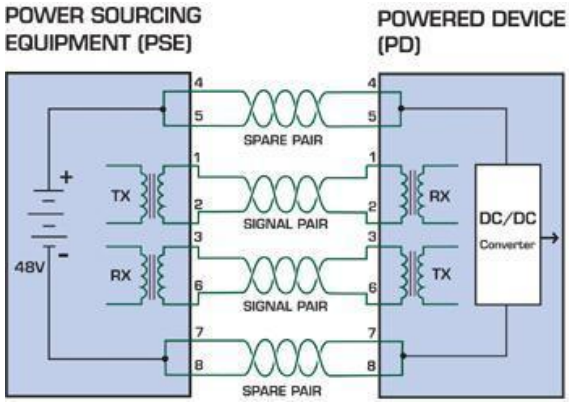


Table 7 - Power supplied over spare pins

The data pairs are used. Since Ethernet pairs are transformer coupled at each end, DC power may be applied to the center tap of the

isolation transformer without upsetting the data transfer. In this mode of operation the pair on pins 3 and 6 and the pair on pins 1 and 2 can be of either polarity.

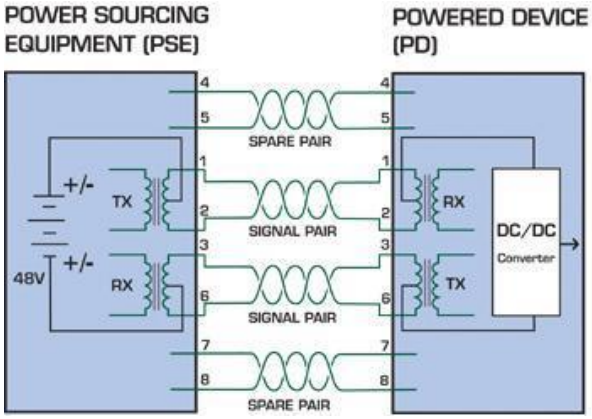


Table 8 - Power supplied over data pins

References:

- IEEE Std 802.3af-2003
  - (Amendment to IEEE Std 802.3-2002, including IEEE Std 802.3ae-2002), 2003 Page(s):0_1-121
- White Paper on Power over Ethernet (IEEE802.3af)
  - Hhttp://www.poweroverethernet.com/articles.php?article_id=52
- Microsemi /PowerDsine
  - Hhttp://www.microsemi.com/PowerDsine/
- Linear Tech
  - Hhttp://www.linear.com/

C.2. PoE Provisioning Process

It should be noted that proper preparation is needed prior to initializing a PoE network in order to minimize the risk of damage to hardware not designed for network-based power provisioning. Despite the fact that adding PoE support to network devices is a relatively simple operation, read this section carefully and understand this process before attempting to transfer power through CAT-5 to these devices.

The PSE is a device that manages the power flow over an Ethernet cable. During the detection period, a small voltage level is induced on the port's output until a PD is detected. The PSE may choose to perform classification; to estimate the amount of power to be consumed by this PD. After a time-controlled start-up, the PSE begins supplying the 48 VDC level to the PD, till it is physically or electrically disconnected, during which voltage and power will shut down.

Since the PSE is responsible for the PoE process timing, it is the one generating the probing signals prior to operating the PD and monitoring the various scenarios that may occur during operation.

All probing is done using voltage induction and current measurement in return.

Stage	Action	Volts specified per 802.3af	Volts managed by chipset
Detection	Measure whether powered device has the correct signature	2.7-10.0	1.8–10.0

	resistance of 15–33 kΩ		
Classification	Measure which power level class the resistor indicates	14.5-20.5	12.5–25.0
Startup	Where the powered device will startup	>42	>38
Normal operation	Supply power to device	36-57	25.0–60.0

Table 9 - Stages of PoE

C.2.1. Line Detection

Before power is applied, for safety reasons a valid PD is connected to the PSE's output first. This process is referred to as "line detection", and involves the PSE seeking a specific 25 KΩ signature resistor. Detection of this signature indicates that a valid PD is connected, and that provision of power to the device may commence.

The signature resistor is isolated in the PD's PoE front-end, away from the rest of the PD's circuitries till detection is certified.

C.2.2. Classification

Once a PD is detected, the PSE may optionally perform classification to determine the maximal power a PD is to consume. The PSE induces 15.5-20.5 VDC, limited to 100 mA, for a period of 10 to 75 ms responded by a certain current consumption by the PD, indicating its power class.

The PD is assigned to one of 5 classes: 0 (default class) indicates that full 15.4 watts should be provided, 1-3 indicate various required power levels and 4 is reserved for future use. PDs that do not support classification are assigned class 0. Special care must be employed in the definition of class thresholds, as classification may be affected by cable losses.

Classifying a PD according to its power consumption ideally helps a PoE system in optimizing its power distribution, so that efficient power management based on classification results may reduce total system costs.

C.2.3. Start-up

Once line detection and optional classification stages are completed, the PSE must switch from low voltage to its full voltage capacity (44-57 Volts) over a minimal amount of time (above 15 microseconds). A gradual startup is required to avoid a sudden rise in voltage (reaching high frequencies) would introduce noise on the data lines. Once provision of power is initiated, it is common for an inrush current to be experienced at the PSE port, due to the PD’s input capacitance. A PD must be designed to cease inrush current consumption (of over 350 mA) within 50 ms of power provision startup.

C.2.4. Operation

During normal operation, the PSE provides 44-57 VDC, able to support a minimum of 15.4 watts power.

C.2.5. Power Overloads

The IEEE 802.3af standard defines the handling of overload conditions. In the event of an overload (a PD drawing a higher power level than the allowed 12.95 Watts), or an outright short circuit caused by a failure in cabling or in the PD, the PSE must shut down power within 50 to 75 milliseconds, while limiting current drain during this period to protect the cabling infrastructure. Immediate voltage drop is avoided to prevent shutdown due to random fluctuations.

C.3. Power Disconnection Scenarios

The IEEE 802.3af standard requires that devices powered over Ethernet be disconnected safely (i.e. power needs be shut down within a short period of time following disconnection of a PD from an active port). When a PD is disconnected, there is a danger that it will be replaced by a non-PoE-ready device while power is still on to avoid damaging the device and risking injury.

The standard defines two means of disconnection, DC Disconnect and AC Disconnect, both of which provide the same functionality - the PSE shutdowns power to a disconnected port within 300 to 400ms. The upper boundary is a physical human limit for disconnecting one PD and reconnecting another.

- DC Disconnect

DC Disconnect detection involves measurement of current. A disconnected PD stops consuming current, which can be inspected by the PSE. The PSE must therefore disconnect power within 300 to 400 ms from the current flow stop. The lower time boundary is important to prevent shutdown due to random fluctuations.

- AC Disconnect

This method is based on the fact that when a valid PD is connected to a port, the AC impedance measured on its terminals is significantly lower than in the case of an open port (disconnected PD).

AC Disconnect detection involves the induction of low AC signal in addition to the 48 VDC operating voltage. The returned AC signal amplitude is monitored by the PSE at the port terminals. During normal operation, the PD's relatively low impedance lowers the returned AC signal while a sudden disconnection of this PD will cause a surge to the full AC signal level and will indicate PD disconnection.

APPENDEX D: GLOSSARY

A

Aggregation

Aggregation is a method wherein multiple ports are used in parallel to increase the link speed beyond the limits of a port and to increase the redundancy for higher availability.

Auto-Negotiation

Auto-negotiation is the process where two different devices establish the mode of operation and the speed settings that can be shared by those devices for a link.

D

DEI

DEI is an acronym for Drop Eligible Indicator. It is a 1-bit field in the VLAN tag.

DHCP

DHCP is an acronym for Dynamic Host Configuration Protocol. It is a protocol used for assigning dynamic IP addresses to devices on a network. DHCP used by networked computers (clients) to obtain IP addresses and other parameters such as the default gateway, subnet mask, and IP addresses of DNS servers from a DHCP server.

The DHCP server ensures that all IP addresses are unique, for example, no IP address is assigned to a second client while the first client's assignment is valid (its lease has not expired). Therefore, IP address pool management is done by the server and not by a human network administrator.

Dynamic addressing simplifies network administration because the software keeps track of IP addresses rather than requiring an administrator to manage the task. This means that a new computer can be added to a network without the hassle of manually assigning it a unique IP address.

DHCP Relay

DHCP Relay is used to forward and to transfer DHCP messages between the clients and the server when they are not on the same subnet domain.

The DHCP option 82 enables a DHCP relay agent to insert specific information into a DHCP request packets when forwarding client DHCP packets to a DHCP server and remove the specific information from a DHCP reply packets when forwarding server DHCP packets to a DHCP client. The DHCP server can use this information to implement IP address or other assignment policies. Specifically the option works by setting two sub-options: Circuit ID (option 1) and Remote ID (option2). The Circuit ID sub-option is supposed to include information specific to which circuit the request came in on. The Remote ID sub-option was designed to carry information relating to the remote host end of the circuit.

The definition of Circuit ID in the switch is 4 bytes in length and the format is "vlan_id" "module_id" "port_no". The parameter of "vlan_id" is the first two bytes represent the VLAN ID. The parameter of "module_id" is the third byte for the module ID (in standalone switch it always equal 0, in stackable switch it means switch ID). The parameter of "port_no" is the fourth byte and it means the port number.

The Remote ID is 6 bytes in length, and the value is equal the DHCP relay agents MAC address.

DHCP Snooping

DHCP Snooping is used to block intruder on the untrusted ports of the switch device when it tries to intervene by injecting a bogus DHCP reply packet to a legitimate conversation between the DHCP client and server.

DNS

DNS is an acronym for Domain Name System. It stores and associates many types of information with domain names. Most importantly, DNS translates human-friendly domain names and computer hostnames into computer-friendly IP addresses. For example, the domain name www.example.com might translate to 192.168.0.10.

I

IEEE 802.1X

IEEE 802.1X is an IEEE standard for port-based Network Access Control. It provides authentication to devices attached to a LAN port, establishing a point-to-point connection or preventing access from that port if authentication fails. With 802.1X, access to all switch ports can be centrally controlled from a server, which means that authorized users can use the same credentials for authentication from any point within the network.

IGMP

IGMP is an acronym for Internet Group Management Protocol. It is a communications protocol used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and adjacent multicast routers to establish multicast group memberships. It is an integral part of the IP multicast specification, like ICMP for unicast connections. IGMP can be used for online video and gaming, and allows more efficient use of resources when supporting these uses.

IGMP Querier

A router sends IGMP Query messages onto a particular link. This router is called the Querier.

IP

IP is an acronym for Internet Protocol. It is a protocol used for communicating data across an internet network.
IP is a "best effort" system, which means that no packet of information sent over it is assured to reach its destination in the same condition it was sent. Each device connected to a Local Area Network (LAN) or Wide Area Network (WAN) is given an Internet Protocol address, and this IP address is used to identify the device uniquely among all other devices connected to the extended network.
The current version of the Internet protocol is IPv4, which has 32-bits Internet Protocol addresses allowing for in excess of four billion unique addresses. This number is reduced drastically by the practice of webmasters taking addresses in large blocks, the bulk of which remain unused. There is a rather substantial movement to adopt a new version of the Internet Protocol, IPv6, which would have 128-bits Internet Protocol addresses. This number can be represented roughly by a three with thirty-nine zeroes after it. However, IPv4 is still the protocol of choice for most of the Internet.

IP Source Guard

IP Source Guard is a secure feature used to restrict IP traffic on DHCP snooping untrusted ports by filtering traffic based on the DHCP Snooping Table or manually configured IP Source Bindings. It helps prevent IP spoofing attacks when a host tries to spoof and use the IP address of another host.

L

LACP

LACP is an IEEE 802.3ad standard protocol. The Link Aggregation Control Protocol, allows bundling several physical ports together to form a single logical port.

LLDP

LLDP is an IEEE 802.1ab standard protocol.

The Link Layer Discovery Protocol (LLDP) specified in this standard allows stations attached to an IEEE 802 LAN to advertise, to other stations attached to the same IEEE 802 LAN, the major capabilities provided by the system incorporating that station, the management address or addresses of the entity or entities that provide management of those capabilities, and the identification of the stations point of attachment to the IEEE 802 LAN required by those management entity or entities. The information distributed via this protocol is stored by its recipients in a standard Management Information Base (MIB), making it possible for the information to be accessed by a Network Management System (NMS) using a management protocol such as the Simple Network Management Protocol (SNMP).

LLDP-MED

LLDP-MED is an extension of IEEE 802.1ab and is defined by the telecommunication industry association (TIA-1057).

M

MAC Table

Switching of frames is based upon the DMAC address contained in the frame. The switch builds up a table that maps MAC addresses to switch ports for knowing which ports the frames should go to (based upon the DMAC address in the frame). This table contains both static and dynamic entries. The static entries are configured by the network administrator if the administrator wants to do a fixed mapping between the DMAC address and switch ports. The frames also contain a MAC address (SMAC address), which shows the MAC address of the equipment sending the frame. The SMAC address is used by the switch to automatically update the MAC table with these dynamic MAC addresses. Dynamic entries are removed from the MAC table if no frame with the corresponding SMAC address has been seen after a configurable age time.

Mirroring

For debugging network problems or monitoring network traffic, the switch system can be configured to mirror frames from multiple ports to a mirror port. (In this context, mirroring a frame is the same as copying the frame.)

Both incoming (source) and outgoing (destination) frames can be mirrored to the mirror port.

P

PD

PD is an acronym for Powered Device. In a PoE system the power is delivered from a PSE (power sourcing equipment) to a remote device. The remote device is called a PD.

PHY

PHY is an abbreviation for Physical Interface Transceiver and is the device that implements the Ethernet physical layer (IEEE-802.3).

PING

ping is a program that sends a series of packets over a network or the Internet to a specific computer in order to generate a response from that computer. The other computer responds with an acknowledgment that it received the packets. Ping was created to verify whether a specific computer on a network or the Internet exists and is connected.

ping uses Internet Control Message Protocol (ICMP) packets. The PING Request is the packet from the origin computer, and the PING Reply is the packet response from the target.

PoE

PoE is an acronym for Power Over Ethernet.

Power Over Ethernet is used to transmit electrical power, to remote devices over standard Ethernet cable. It could for example be used for powering IP telephones, wireless LAN access points and other equipment, where it would be difficult or expensive to connect the equipment to main power supply.

Policer

A policer can limit the bandwidth of received frames. It is located in front of the ingress queue.

Private VLAN

In a private VLAN, communication between ports in that private VLAN is not permitted. A VLAN can be configured as a private VLAN.

Q

QCE

QCE is an acronym for QoS Control Entry. It describes QoS class associated with a particular QCE ID.

There are six QCE frame types: Ethernet Type, VLAN, UDP/TCP Port, DSCP, TOS, and Tag Priority. Frames can be classified by one of 4 different QoS classes: "Low", "Normal", "Medium", and "High" for individual application.

QCL

QCL is an acronym for QoS Control List. It is the list table of QCEs, containing QoS control entries that classify to a specific QoS class on specific traffic objects.

Each accessible traffic object contains an identifier to its QCL. The privileges determine specific traffic object to specific QoS class.

QoS

QoS is an acronym for Quality of Service. It is a method to guarantee a bandwidth relationship between individual applications or protocols.

A communications network transports a multitude of applications and data, including high-quality video and delay-sensitive data such as real-time voice. Networks must provide secure, predictable, measurable, and sometimes guaranteed services.

Achieving the required QoS becomes the secret to a successful end-to-end business solution. Therefore, QoS is the set of techniques to manage network resources.

R

Router Port

A router port is a port on the Ethernet switch that leads a switch towards a multicast device.

RSTP

In 1998, the IEEE with document 802.1w introduced an evolution of STP: the Rapid Spanning Tree Protocol, which provides for faster spanning tree convergence after a topology change. Standard IEEE 802.1D-2004 now incorporates RSTP and obsoletes STP, while at the same time being backwards-compatible with STP.

S

SHA

SHA is an acronym for Secure Hash Algorithm. It designed by the National Security Agency (NSA) and published by the NIST as a U.S. Federal Information Processing Standard. Hash algorithms compute a fixed-length digital representation (known as a message digest) of an input data sequence (the message) of any length.

STP

Spanning Tree Protocol is an OSI layer-2 protocol which ensures a loop free topology for any bridged LAN. The original STP protocol is now obsolete by RSTP.

T

Tag Priority

Tag Priority is a 3-bit field storing the priority level for the 802.1Q frame.

TCP

TCP is an acronym for Transmission Control Protocol. It is a communications protocol that uses the Internet Protocol (IP) to exchange the messages between computers.

The TCP protocol guarantees reliable and in-order delivery of data from sender to receiver and distinguishes data for multiple connections by concurrent applications (for example, Web server and e-mail server) running on the same host.

The applications on networked hosts can use TCP to create connections to one another. It is known as a connection-oriented protocol, which means that a connection is established and maintained until such time as the message or messages to be exchanged by the application programs at each end have been exchanged. TCP is responsible for ensuring that a message is divided into the packets that IP manages and for reassembling the packets back into the complete message at the other end.

Common network applications that use TCP include the World Wide Web (WWW), e-mail, and File Transfer Protocol (FTP).

ToS

ToS is an acronym for Type of Service. It is implemented as the IPv4 ToS priority control. It is fully decoded to determine the priority from the 6-bit ToS field in the IP header. The most significant 6 bits of the ToS field are fully decoded into 64 possibilities, and the singular code that results is compared against the corresponding bit in the IPv4 ToS priority control bit (0~63).

U

UDP

UDP is an acronym for User Datagram Protocol. It is a communications protocol that uses the Internet Protocol (IP) to exchange the messages between computers.

UDP is an alternative to the Transmission Control Protocol (TCP) that uses the Internet Protocol (IP). Unlike TCP, UDP does not provide the service of dividing a message into packet datagrams, and UDP doesn't provide reassembling and sequencing of the packets. This means that the application program that uses UDP must be able to make sure that the entire message has arrived and is in the right order. Network applications that want to save processing time because they have very small data units to exchange may prefer UDP to TCP.

UDP provides two services not provided by the IP layer. It provides port numbers to help distinguish different user requests and, optionally, a checksum capability to verify that the data arrived intact.

Common network applications that use UDP include the Domain Name System (DNS), streaming media applications such as IPTV, Voice over IP (VoIP), and Trivial File Transfer Protocol (TFTP).

User Priority

User Priority is a 3-bit field storing the priority level for the 802.1Q frame.

V

VLAN

Virtual LAN is a method restricting communication between switch ports. VLANs can be used for the following applications:

VLAN unaware switching: This is the default configuration. All ports are VLAN unaware with Port VLAN ID 1 and members of VLAN 1. This means that MAC addresses are learned in VLAN 1, and the switch does not remove or insert VLAN tags.

VLAN aware switching: This is based on the IEEE 802.1Q standard. All ports are VLAN aware. Ports connected to VLAN aware switches are members of multiple VLANs and transmit tagged frames. Other ports are members of one VLAN, set up with this Port VLAN ID, and transmit untagged frames.

Provider switching: This is also known as Q-in-Q switching. Ports connected to subscribers are VLAN unaware, members of one VLAN, and set up with this unique Port VLAN ID. Ports connected to the service provider are VLAN aware, members of multiple VLANs, and set up to tag all frames. Untagged frames received on a subscriber port are forwarded to the provider port with a single VLAN tag. Tagged frames received on a subscriber port are forwarded to the provider port with a double VLAN tag.

VLAN ID

VLAN ID is a 12-bit field specifying the VLAN to which the frame belongs.